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[See Page 27]

[From Sennertus: Operum. Lugduni, 1676.]

ANNALS OF MEDICAL HISTORY

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SIR GEORGE MURRAY HUMPHRY, M.D., F.R.S.

PROFESSOR OF ANATOMY (1866–1883) AND OF SURGERY (1883–1896) IN THE UNIVERSITY OF CAMBRIDGE, ENGLAND

By SIR HUMPHRY ROLLESTON, BART., K.C.B., M.D.

CAMBRIDGE, ENGLAND

SIR George Murray Humphry (1820–1896) was an example of the triumph of a keen mind and indomitable energy over a frail, painful body, and as a country surgeon his was a name to conjure with at a time when surgery was much more concentrated in the metropolis than it is now. Born on July 18, 1820, at Sudbury in Suffolk, of which he received the freedom in 1892, he was the third son of William Wood Humphry, barrister-at-law and distributor of stamps for Suffolk. For generations the family had been prominent in the borough and more than one had held the office of mayor. His elder brother, William Gilson Humphry, B.D. (1815–1880), was senior classic (1837) and Fellow of Trinity College, Cambridge, Vicar of Northolt, Middlesex, and later of St. Martin's-in-the-Fields, London, and author of many works including "A Commentary on the Acts of the Apostles" (1847), well known as "Humphry on the Acts." Another brother, J. T. Humphry, followed in the father's footsteps as a barrister in London, so the family was well represented in the learned professions.

On account of *res angusta domi* Humphry's education at the Grammar Schools of Sudbury and Dedham was short, and he may have felt this as somewhat of a handicap, for in his eloquent Hunterian Oration (1879) he said that twenty, John Hunter's age when he started medical work, was the best time to begin, and that the medical profession had suffered in quality, status, and practical outcome from being commenced, in many instances, too early by lads. At any rate, it may have been more than a coincidence that, although he took the M.B. degree at Cambridge in 1852, he did not proceed to the M.D. until 1859 when the obligation to write the thesis in Latin was removed.

At the early age of sixteen Humphry was apprenticed to John Green Crosse (1790–1850) of Norwich in the year that this famous lithotomist (for in those days the Eastern Counties were notorious for urinary calculi) was elected a Fellow of the Royal Society; he thus acted as dresser and clerk in the Norfolk and Norwich Hospital and picked up a knowledge of dispensing. In an address given to the Oxford Medical Society the year before his death on "Some Changes in Medicine and Surgery during the Last Sixty Years,"[1] he described the heroic venesections of those early days, and went on: "Persons, generally about middle age, used to come to the surgery at spring and fall to be blooded, and I calmly would take away, at a shilling a head, *pleno rivo*, sixteen or twenty ounces, and the good people did not seem the worse for the loss, either in body or pocket." After three years with this scientific surgeon, whom in 1895 he described as "one of the most learned and able surgeons I have ever known and in addition gave me an early interest in the work of a pathological museum which has lasted through my life," the future professor, first of Human Anatomy and then of Surgery, went to St. Bartholomew's Hospital. Here he came under the influence of William Lawrence, P. M. Latham and James Paget, the curator of the Museum, and in after life spoke so often of Peter Mere Latham's clear and emphatic lectures that it is probably safe to assume that to some extent his own style of lecturing was modelled on that of this great physician. He was a distinguished student, and in 1840 obtained the Gold Medal for anatomy and physiology at the University of London, though he never proceeded to the final M.B. degree. He qualified at the Society of Apothecaries and the Royal College of Surgeons of England in 1842, but before he had time to be a house surgeon or, as he said, had amputated even a finger, he was elected, with the help of the brothers James and George Paget, full surgeon to Addenbrooke's Hospital, Cambridge, thus becoming in his twenty second year the youngest surgeon to a hospital in Great Britain. On August 18, 1842, the three surgeons to Addenbrooke's, C. Lestourgeon, Senior (surgeon 1813–1842), John Okes and A. S. Abbott, resigned, apparently, as far as the records show, under a recently introduced time limit of twelve years' service, and at the election on October 31 the voting was as follows: C. Lestourgeon, Junior, 280 votes, Josiah Hammond 226, A. M. Humfrey (*sic*) 221, Sudbury 103, G. W. Thurnall 83, and E. Knowles 20 votes. The first three were therefore elected surgeons. In December, Dr. Frederick Thackeray and Professor John Haviland, on behalf of the medical staff, obtained permission from the Hospital Board to institute a system of clinical lectures; this move has in other quarters been ascribed to the influence of Sir George Paget in conjunction with Humphry, whose clinical lectures appeared in the *Provincial Medical and Surgical Journal*, the grandmother of the *British Medical Journal*, in 1849–1851, and in book form in 1851 at Worcester. Two years after (1844), and in virtue of his hospital appointment, Humphry was elected a Fellow of the Royal College of Surgeons of England, but, being under the statutory age of twenty-five years, had to wait for formal admission. In 1847 the professor of Anatomy, the Rev. William Clark, M.D., F.R.C.P. (1788–1869) obtained Humphry's services as his assistant to teach human anatomy, a step of momentous importance, as it turned out, for the future of the Medical School. Professor Clark, who really started biological science in Cambridge and held three livings in succession during his tenure of the Chair, did not resign until 1865, when a syndicate appointed to consider the professorship recommended that in future there should be two professorships, one of human anatomy and a new one of zoology and comparative anatomy. It is not surprising that this proposition, which in the then state of opinion about natural science must have appeared revolutionary, excited an outburst of fly-leaves. But the Grace for this reform was approved by the Senate. Humphry, who had taught human anatomy for eighteen years, was elected professor. His colleague at Addenbrooke's, C. Lestourgeon, also put in an application, but retired before the day of election. For the new professorship W. H. D. Drosier, M.D., of Gonville and Caius, who as deputy had given the lectures on the subject since October, 1860, was a candidate; but Alfred Newton, late Fellow of Magdalene College, was elected on March 1, 1866, by 110 to 82 votes and held office for forty-one years. On the day before the election Newton wrote to his friend, Canon H. B. Tristram: "Except Humphry, the Professor (elect) of Anatomy, I have all the medicos in the place *actively* against me. They consider that it is profanity for a layman to be a dealer in bones."

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[1] *Med. Mag.*, Lond., 1895, IV, 1031.

In the meanwhile Humphry was extremely active; he joined the University in the Lent term of 1847, entering Downing College as a Fellow Commoner, a modified status of undergraduate with special fees and privileges, which, though now very seldom adopted, has never been abolished. He took the degrees of M.B. in 1852, and M.D. in 1859, and was constantly engaged in teaching, research, writing and practice. Arriving with few friends and less money, he had, it was said, to borrow the wherewithal to buy a horse to go his rounds. Like Thomas Young, Andrew Clark and Michael Foster he was threatened with pulmonary tuberculosis, and according to current medical opinion had been recommended to take horse exercise; in later life he often said that each hair of that horse has been worth a guinea as a means to recovery; but after a time he gave up riding and was driven round in a light dogcart, sitting on the back seat, and as often as not crouched up to avoid the wind and rain. In 1843, after right-sided pleurisy he had an attack of phlebitis, which recurred after typhoid fever in 1847 and after left-sided pleurisy in 1851. This experience he turned to account by writing his M.D. thesis in 1859, "On the Coagulation of the Blood in the Venous System during Life"[2] which contains notes of a number of cases, the first beginning:

> My own attention was first particularly directed to this disease, in 1843, by its occurrence in a member of our profession, a tall, thin, delicate person, who when just beginning to recover from an attack of pleurisy on the right side, by which he had been much prostrated, experienced an uneasiness and stiffness in the left groin and side of the pelvis. For a day or two he did not pay much attention to the symptom, thinking he had probably strained himself by lying in an awkward position, though there was in reality no ground for such an idea.

SIR GEORGE MURRAY HUMPHRY, M.D., F.R.S. (1820–1896).

Subsequently the other thigh was attacked, but fortunately the two recurrences in subsequent years were less severe.

No wonder he took a keen interest in this disease, especially in the case of his house surgeon at Addenbrooke's, W. Rivers Pollock, the amateur hurdler who in 1884 won the 120-yard hurdles for Cambridge against Oxford in the then record time of sixteen seconds, holding his breath for the whole time. Immediately after the race he had pain in the lumbar region, and edema of the legs and lower part of the trunk followed. He was extremely ill, was prayed for in chapel at Trinity College, and was confined to bed for six months. The albuminuria and very considerable distention of the superficial veins persisted till his death twenty-five years later from septicemia. Dr. Pollock (1859–1909), who was obstetric physician to the Westminster Hospital (1901–1909), left his body to the Royal College of Surgeons for dissection, and the late Professor S. G. Shattock found that the inferior vena cava was obliterated from the entrance of the hepatic veins downwards, so that the blood from the kidneys must have passed by channels other than the renal veins, and concluded that the thrombosis was probably secondary to rupture of the inner coat of the inferior vena cava caused by the strain during the race, a dissecting varix analogous to a dissecting aneurysm.

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[2] *Brit. Med. J.*, Lond., 1859, p. 582 and published with additions, Camb., 1859.

In 1849 Humphry married Mary, daughter of Daniel Robert McNab, a surgeon of Epping in Essex, and his brother, J. T. Humphry, married her sister, both of them being considerable heiresses. Mrs. Humphry was in a very special and practical sense a helpmate in his life's work by making accurate drawings for his books and papers. The great work, "A Treatise on the Human Skeleton (including the joints) by George Murray Humphry, Esqre., M.B., F.R.C.S., Surgeon to Addenbrooke's Hospital, Lecturer on Anatomy and Surgery in the Cambridge University Medical School," 1858 (pp. 620) was the outcome of many years' industry and thought, and no doubt earned him the F.R.S. in the following year. The value of this philosophical and epoch-making work was enhanced by the sixty illustrations, all done on stone, by his wife. Of this monograph the late C. B. Lockwood, also anatomist and scientific surgeon, wrote: "How many succeeding lecturers on anatomy have not delved into this rich and precious mine for jewels wherewith to adorn their teaching?" It would seem to have formed a starting point for original papers on pathological changes in bone, such as the angle of the neck of the femur,[3] flat-foot,[4] and back knee, knock-knee, bow-knee.[5] "The Human Foot and the Human Hand, based on two popular lectures in Cambridge by George Murray Humphry, M.D., F.R.S., Lecturer on Anatomy and Physiology in the University of Cambridge," appeared in 1861. Many of his contributions are buried in the weekly medical press of his early years, such as reports of unusual operations; in recording a case of ovariotomy with tetanus during recovery[6] he referred to his collection some years before of all or nearly all the reported ovariotomies for the purpose of making up his mind as to the propriety of performing the operation; of these 105 cases 50, or less than half, were successful, 39, or more than a third, proved fatal, and in the remainder the operation could not be completed. In 1863 Spencer Wells, who made this operation safe, published 50 cases with 66 per cent of successes, and in 1881 the recovery rate of his 1000 cases was 76 per cent. In 1896 the late Greig Smith estimated that in capable hands the mortality was about 4 per cent.

As a result of his energetic advocacy, Addenbrooke's Hospital was largely rebuilt from plans he prepared in 1864–1865; he was active in founding the Cambridge Medical Society in 1880, being its president in 1882 and 1883, and was president of the Cambridge Philosophical Society, 1871–1873. Anxious to enable medical students of small means to come to the University, he established in 1859 "Dr. Humphry's Hostel for Medical Students" of which he was principal. This was at 56 Trumpington Street, and in 1860 accommodated five students; in 1861 there were six, and in 1862 the number fell to three; after this year the hostel appears to have lapsed. The house has since remained in medical hands, alternately medical and surgical.

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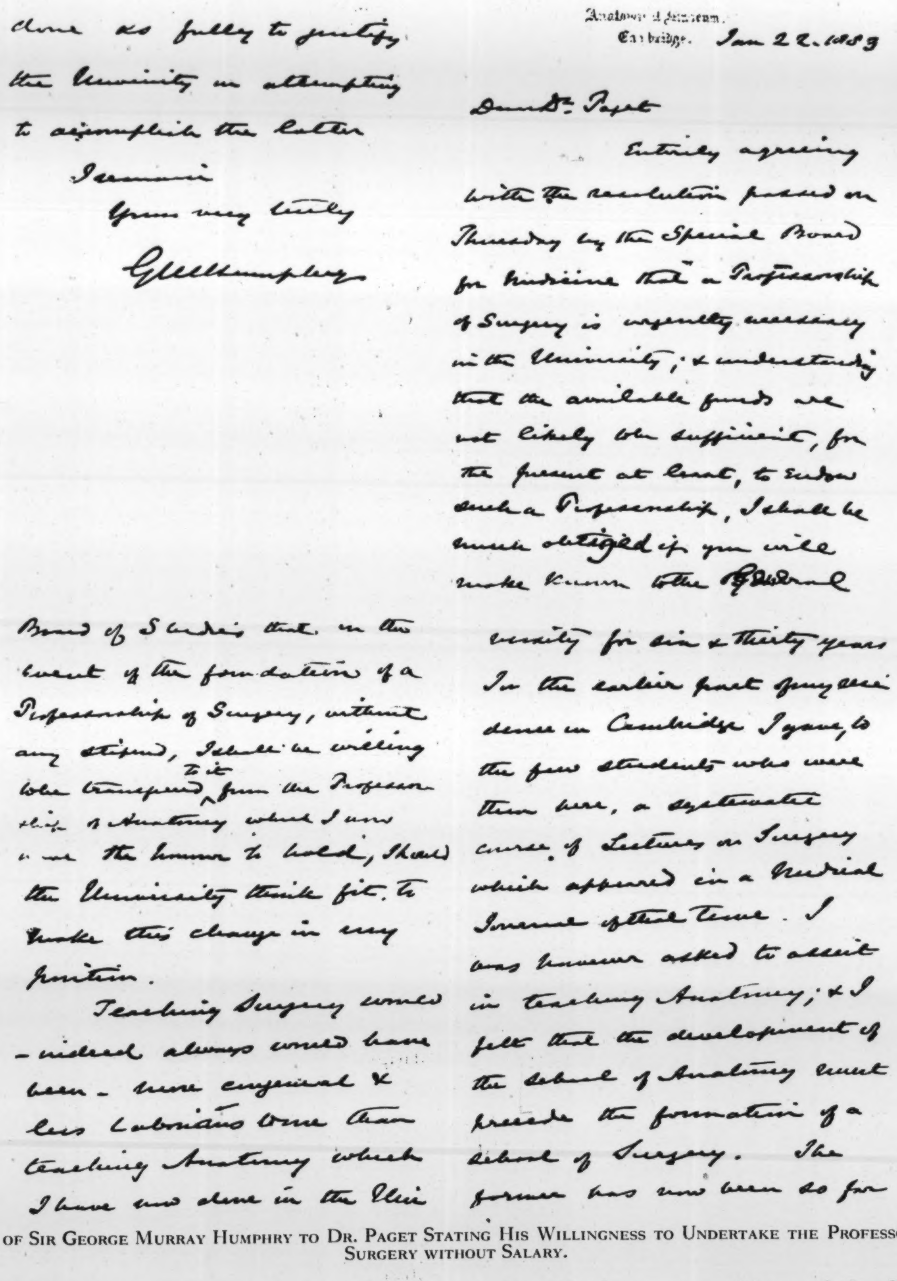
[3] Humphry, G. M. Observations on the angle of the neck of the thigh-bone. *J. Anat. & Physiol.*, Lond., 1888–1889, XXIII, 387.

[4] *Ibid.*, 1887, XXI, 155.

[5] Humphry, G. M. Back knee, knock-knee, bow-knee and other deformities resulting from defect of growth at the epiphyseal lines. *Med.-Chir. Tr.*, Lond., 1889, LXXII, 165.

[6] *Assoc. Med. J.*, 1856, p. 121.



LETTER OF SIR GEORGE MURRAY HUMPHRY TO DR. PAGET STATING HIS WILLINGNESS TO UNDERTAKE THE PROFESSORSHIP OF SURGERY WITHOUT SALARY.

Anatomical Museum.
Cambridge. Jan 22. 1883

Dear Dr. Paget

Entirely agreeing with the resolution passed on Thursday by the Special Board for Medicine that a Professorship of Surgery is urgently necessary in the University; & understanding that the available funds are not likely to be sufficient, for the present at least, to endow such a Professorship, I shall be much obliged if you will make known to the General Board of Studies that in the event of the foundation of a Professorship of Surgery, without any stipend, I shall be willing to be transferred to it from the Professorship of Anatomy which I now have the honour to hold, should the University think fit to make this change in my position.

Teaching Surgery would – indeed always would have been – more congenial & less laborious to me than teaching Anatomy which I have now done in the University for six & thirty years. In the earlier part of my residence in Cambridge I gave, to the few students who were then here, a systematic course of Lectures on Surgery which appeared in a Medical Journal of that time. I was however asked to assist in teaching Anatomy; & I felt that the development of the school of Anatomy must precede the formation of a school of Surgery. The former has now been so far done as fully to justify the University in attempting to accomplish the latter.

I remain
Yours very truly
G M Humphry

In 1864 he was president of the Surgical Section at the Cambridge meeting of the British Medical Association, and in his address insisted on pathology, in all its branches, as the very cornerstone of surgery, and expressed regret that the Universities of Oxford and Cambridge had done so little for surgery. His constant desire to promote a School of Medicine in Cambridge was also shown in 1880, when the British Medical Association again met in that university town under his presidency. In his presidential address he discussed and partly explained why "Cambridge, more than any university in the work, with perhaps one exception, had banished medicine from its walls, and the men of medicine from its schools." He hoped that when next the Association came to Cambridge there would be a medical tripos. It was forty years on, in 1920, before the Association met there, and it was not until 1925 that pathology became a subject in the second part of the tripos. In this address, acting on a suggestion from his then demonstrator Alex Hill, he also advocated and subsequently organized a collective investigation of disease committee of which he became the chairman. An extensive scheme was at once set in being, with fifty-four committees including 800 to 1000 of the chief practitioners in the kingdom. He edited the "Collective Investigation Records," the first in June, 1883, with the assistance of F. A. Mahomed (1849–1884), and in 1889 brought out his book on "Old Age," in which he analysed the records of 824 persons between the ages of eighty and a hundred years, a very large number of whom he personally investigated. On this favorite subject he had been engaged for a considerable time, and in 1885 had utilized it for the annual oration at the Medical Society of London. The Anatomical Society of Great Britain and Ireland started a collective investigation committee in 1889 and brought out the sixth annual report in 1896. The collective investigation of disease flagged after a time, but was revived and expanded by Karl Pearson and his school who have brought exact mathematical science to the aid of medical statistics.

Humphry took an active part in the cause of vivisection, which was much opposed by well-meaning but ill-informed enthusiasm of Miss Frances Power Cobbe and other founders in 1875 of the National Anti-Vivisection Society. He gave evidence before the Royal Commission on Vivisection (1875) and at a meeting of the British Medical Association at Ryde in 1881 made a vigorous speech[7] in its defence, which subsequently involved him in correspondence with supporters of the International Association for the Total Suppression of Vivisection.

"Man, Past, Present, and Future" formed the topic of the Sir Robert Rede Lecture which he delivered in 1880 before the University of Cambridge. Founded in 1524 with the proviso that "The Vice-Chancellor, or in his absence some other honourable Doctor of Divinity of the said Universitie," was to "minister and doe the observaunces" and "to have for his labour therein sixteen pence," this trust suffered the neglect that sometimes befalls the bequests of pious founders. In 1857 the Council of the Senate reported that "for many years past no duties whatever have been discharged," and a new statute was approved, the value of the trust for the annual lecture being nine guineas. Out of sixty-five lecturers Humphry is the only surgeon, and except for Sir Norman Moore, who in 1915 lectured on "St. Bartholomew's Hospital in Peace and War," was the only medical man in practice to be thus honored. Owen, Huxley, Michael Foster and W. A. Miller, the chemist, are the other lecturers with medical qualifications.

Humphry wrote an account of Cambridge, its University and Colleges for the 1864 and 1880 meetings of the British Medical Association, which when expanded and containing an account of the villages within ten miles (by W. P. Spalding) was for many years a popular guide for visitors.

At the Royal College of Surgeons of England he was elected a member of the Council in 1868 and was a member of the Court of Examiners for ten years (1877—1887). From 1871 to 1873 he was an Arris and Gale lecturer on anatomy, and on February 14, 1879, he delivered the Hunterian Oration, the blue ribbon of the College. Devotion to the growing school at Cambridge made him forego nomination for the offices of vice-president and president. Although students held him in awe, he was a liberal marker as an examiner, and, while recognizing the need for examinations, had no hesitation about their evil influences, the chief of which was their tendency to make facts predominate greatly over thought and thus to increase the accumulated load of detail that the student has to carry. With a far-seeing eye he described in 1879 what every teacher now recognizes only too clearly:

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[7] *Brit. Med. J.*, Lond., 1881, ii, 332.

> There is a danger of too much teaching and too little education, of too much pushing and dragging, alias coaching, and too little self-help. . . . The time of pupilage is converted into a period of struggle and cram and painful visions of insatiable examiners, instead of being a period of quiet study and of enjoyable, and proportionately profitable, preparation for the practice of the profession.

Mainly by Humphry's influence human anatomy was recognized as a separate branch of science in the Natural Science Tripos of 1876, after he had educated the University to the view that human anatomy instead of being a mere technical art of use only in the education of medical students, is the most important branch of animal morphology, and illustrates in the best possible manner the general laws of the organization of vertebrate animals. The establishment of the Natural Sciences Tripos in 1851 showed that these sciences were recognized as branches of education in the University, but it was not until 1861 that this tripos was put on the same footing as the Mathematical and Classical Triposes in admitting to the B.A. degree. Humphry also obtained recognition by the Royal College of Surgeons of England of the teaching of anatomy, surgery and medicine at Cambridge, so that from 1871 these subjects were on the same plane in this respect as at other great medical schools. But few students do now or ever did more than go through a short grounding in clinical work, as the clinical material in Cambridge, the population of which is now about 60,000, is in no way comparable with that of large centers; further, the School is not a "complete" one, for there is no lecturer on obstetrics and gynecology, though there was for a time in the past. As students do the great bulk of their hospital work in London or elsewhere, they are more familiar with the teachers of chemistry, physics, biology, physiology, anatomy, pathology and pharmacology than with those of medicine and surgery. Humphry was the representative of Cambridge on the General Medical Council for the long period of twenty years (1869–1889), and was well qualified to write the section in "The Student's Guide to the University of Cambridge" on "Degrees in Medicine and Surgery" which was reprinted in pamphlet form and reached a fifth edition in 1891. By attracting to medicine young men with the internal qualities as well as the external manners of the true gentleman, he did much to raise the status of the medical profession.

In the early eighties the emoluments of Humphry's Chair, which at first had hardly met expenses, became substantial from the fees of the now populous Medical School, and accordingly in 1883 he made way for a whole-time human anatomist, Alexander Macalister, and undertook the professorship of Surgery then founded by the University without any salary. His letter resigning the Anatomical Chair and mentioning that he was willing to take the Surgical Chair without salary is preserved in the Registry of the University. According to his pupil and demonstrator, Dr. Alex Hill, he was fond of maintaining the optimistic doctrine that the efficiency of a teacher increases as his salary falls, and that the usefulness of a University is enhanced by every decline in its revenue. After his death the Chair of Surgery was suspended until 1903 when Howard Marsh was appointed, with a salary of £600 a year, and held it until his death in 1915, having been Master of Downing College for eight years in succession to Alex Hill, M.D., who was Master from 1888 to 1907. No further appointment to the professorship was made, and in 1921 it was discontinued. In 1891 Humphry was knighted, but the title that he preferred was that of Professor. In 1877 he was elected a member of the Athenaeum under Rule II which enacts that:

> It being essential to the maintenance of the Athenaeum, in conformity with the principles on which it was originally founded, that the annual introduction of a certain number of persons of distinguished eminence in science, literature, or the arts, or for public services, should be secured, a limited number of persons of such qualifications shall be elected by the Committee. The number of persons so elected shall not exceed nine in each year.

He was also a professorial Fellow (1884) of King's College, Cambridge, Honorary Fellow of Downing College (1869), Honorary LL.D. Edinburgh (1891), Hon. D.SC. Dublin (1892).

Like John Hunter, Astley Cooper, Brodie, he was an enthusiastic morbid anatomist, much interested in museums and was always on the lookout to obtain specimens for the Cambridge Museum, now appropriately called after him and formally opened together with the medical and other schools, on March 1, 1904, by King Edward and Queen Alexandra. When traveling, his form of recreation, he lost no opportunity of visiting other collections, spent much time, money and persuasion in adding to his store, and was constantly cataloguing and working at the specimens he had accumulated. As his first teacher, Crosse, had been a favorite pupil and demonstrator of James Macartney, professor of Anatomy (1813–1837) in Trinity College, Dublin, he regarded with almost filial affection the 2000 Macartney specimens which were bought by the University in 1836. Humphry supplemented them by purchasing and presenting the collection of Professor Schröder van der Kolk of Utrecht. His broad interests were shown by the analysis of the physiological series in the gallery of the Museum of Comparative Anatomy at Cambridge, which he published in 1866, the same year that he was president of the Section of Physiology at the Nottingham meeting of the British Medical Association; his address on this occasion was published in the first volume (1866) of the *Journal of Anatomy and Physiology*, Cambridge, which he founded with Sir William Turner of Edinburgh. This Journal, at first published twice a year and subsequently quarterly, contains a number of his papers on myology, muscular homologies, the growth and senile changes of bone, and other subjects, his "Observations on Myology" being published in book form in 1872. Humphry was anxious to strengthen the physiological side of the Journal, and in 1872 Sir Michael Foster and Professor William Rutherford of Edinburgh joined the editorial board, but when Foster started the *Journal of Physiology* in 1878 papers on that subject were naturally addressed to that source in the first instance. In 1916, after Turner's death, the title was abbreviated to *The Journal of Anatomy* and the management and ownership passed into the hands of the Anatomical Society of Great Britain and Ireland. It is significant of the initiative and energy of its Medical School that both these Journals were first published and largely promoted in Cambridge. Humphry was naturally chosen to be the first president of the Anatomical Society of Great Britain and Ireland, founded in May, 1887, holding office till 1890 when Sir William Turner succeeded him, and was president of the old Pathological Society of London, 1891–1893.

He was a good and successful surgeon; a big operation gave him much anxiety and disturbed sleep, but when he started he showed courage and great skill. He had been qualified long before the days of anesthesia and antiseptics, and he sometimes dispensed with an anesthetic. His ready resource carried him successfully through many difficulties, such as those entailed by operations in dark cottages by the flickering light of a solitary candle. In 1850, in recording a successful case of suprapubic cystotomy for a urinary calculus[8] he pointed out the reasons for reviving in certain circumstances an operation which, as far as he could determine, had not been performed since the unsuccessful attempts made in St. George's Hospital soon after the publication of Sir Everard Home's cures. In a postgraduate lecture on urinary calculi delivered in June, 1895,[9] he referred to this case in connection with the suprapubic operations:

> It is somewhat strange, and not particularly creditable to me, that, having tested this method in 1848 on a boy aged fourteen who had shown symptoms from birth, I should not again have resorted to it till within the last few years, when it had been revived by others, especially as the case taught me that I over-estimated the ill-effects that were likely to result from extravastion of urine into the loose tissue around the bladder.

Excision of the knee greatly interested him, and his hospital patients, being rather afraid of his enthusiasm, were known to say: "Now, Dr. Humphry, I am not going to have my knee took out." His papers on this subject[10] had a powerful influence in establishing this procedure, even in the pre-Listerian period. He never adopted the antiseptic routine and indeed largely dispensed with dressings, many if not most of the wounds being left simply exposed to the air. He was the first British surgeon to remove successfully a tumor of the male bladder[11] and his position as a representative surgeon was shown by his authorship of the article on "Diseases of the Male Organs of Generation" in Timothy Holmes' "System of Surgery."[12]

Humphry had a striking personality; his hair straight and raven black to the last, his glittering eyes, aquiline nose, sallow complexion, mobile features, facility of expression, of epigrammatic point and of pertinent illustration, his magnetic influence, and interrogative forefinger made him unrivalled as an impressive teacher, whom generations of pupils remember sitting on a carefully poised stool in the dissecting room or museum, or leaning for support on his stick, for standing always tried his slender frame. As the late W. H. Dickinson, his pupil though contemporary, wrote: "There was a fascination in his glance, so piercing and so inquiring; like Cassius, he seemed to look quite through the deeds of men." His half-length portrait on canvas by W. W. Ouless, R.A., in 1886, now in the Fitzwilliam Museum, was presented by his pupils, and, though it would be difficult to convey the impression of his ever-varying expression, many old Cambridge men treasure the engraving of their old teacher. Another portrait, done by his niece, Miss K. M. Humphry, in 1892 on his enrollment as a freeman of his native town, hangs in the Public Hall at Sudbury, and there is a replica of it in the Medical School; this more nearly reproduces the real man. His bust, subscribed for by his pupils and friends in 1891, by Henry Wiles, and that of his colleague, Sir George Paget, are appropriately placed in the ground floor corridor of Addenbrooke's Hospital, and another, executed by H. R. Pinker, is in the Medical School at the door of the Humphry Museum. Of few clinical teachers were so many aphorisms and *obiter dicta* quoted.[13] Keen observer himself, he urged this habit on his students in the out-patient room and wards, for he was convinced that observation and reflection "lie at the root of all success in science." With an enormous store of knowledge, but devoid of any pedantry, he had that much-envied power of clinical instinct born of long experience and conscientious observation. His Socratic method of teaching fixed permanently in his pupils' minds the principles of pathology and surgery, and made them reason and think for themselves. In his Hunterian Oration he reveals his philosophy of the art in which he excelled:

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[8] *Trans. Prov. Med. & Surg. Ass.*, Worcester, 1850, XVII, 103.

[9] Humphry, Sir G. M. Urinary calculi; their formation and structure. *J. Anat. & Physiol.*, Lond., 1895–1896, XXX, 296.

[10] *Med.-Chir. Tr.*, Lond., 1858, XLI, 193; 1869, LII, 13.

[11] Tumour in the bladder removed by perineal incision. *Med.-Chir. Tr.*, Lond., 1879, LXII, 421.

[12] Ed. 1, Lond., 1860–1864, IV, 539–625; revised in Ed. 2, N. Y., 1869–1870, V, 71–182.

[13] *Vide* Rolleston, Sir H. Some Worthies of the Cambridge Medical School. ANNALS OF MEDICAL HISTORY, 1926, VIII, 331.

> Wherein, in the main, do we most perceive the differences between the good teacher and the bad? . . . From the one they [the pupils] obtain knowledge and derive stimulus to the pleasure of mental effort; from the other they fail to acquire these. The one, Hunter-like, associates facts with thoughts, connects the body with the spirit, and so makes it animate and buoyant; the other gives facts without thoughts, presents the body without the spirit, lifeless, depressing, an *indigesta moles*. The one brings the facts into relation with each other and binds them together by laws and principles, and so fastens them in the memory; the other leaves them isolated, scattered, evanescent.

Not an orator in the sense that he hypnotized and carried his audience off their feet, he was a clear and persuasive speaker, and being masterful, nearly always gained his point, but thereby sometimes created considerable friction. It was said, though of this I have little personal knowledge, that he was not an infallible judge of men. Abstemious and almost penurious as regards his own comforts, he was much given to hospitality, and many generations of undergraduates, shy and otherwise, enjoyed the gracious hospitality of Grove Lodge, and remember the numerous small servant girls who waited at dinner and were being trained for domestic service by his wife. Kindly in small things, such as remitting fees to the poor, he was generous on a large scale. A Liberal in politics, he was approached in 1886 by the Reverend G. F. (afterwards Bishop) Browne on behalf of the University to find out if he would stand for election to Parliament as one of the representatives; he declined saying that the regius professor of Physic, Sir George Paget, was the proper person for this post; and similarly Paget, when sounded, excused himself and indicated Humphry as the appropriate candidate. Sir George Gabriel Stokes, who was president of the Royal Society (1885–1890), was eventually elected.

As late as his seventieth year he brought out a paper on "Senile Hypertrophy and Senile Atrophy of the Skull"[14] which bears witness to his knowledge of museums in this country and on the Continent. The occurrence of symmetrical holes in the parietal bones had long interested him; in his "Human Skeleton" he had regarded them as congenital in origin, but in 1890 he described them as due to a senile atrophic process possibly connected with the pressure of the occipito-frontalis tendon, stretched over and playing upon the most prominent part of the vertex. Writing from Egypt ten years after Humphry's death, Elliot Smith[15] described this change as common in the tombs of the well-to-do in the period between the fourth and nineteenth dynasties, when enormous and heavy wigs were worn, and suggested that the thinning of the bone was due to the constant pressure thus exerted. This subject has been fully reviewed by D. M. Greig[16] who concludes that as a result, absence of diploë from the affected area of the parietal bone, abiotrophy (an imperfection not apparent congenitally but becoming so during the process of growth) results.

Humphry also wrote "On Macrodactyly, and Some Other Forms of Congenital Overgrowth, and Their Relation to Tumors."[17] In his clinical account of tetanus in Allbutt's "System of Medicine,"[18] published in the year of his death, he described many cases, including one he watched in the Norwich Hospital in 1837, and among the methods of treatment he had employed before the advent of antitoxin mentioned tobacco in the form of an enema, but in those early days he found that the administration of food was the only hopeful treatment.

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[14] *Med.-Chir. Tr.*, Lond., 1890, LXXIII, 327.

[15] The causation of the symmetrical thinning of the parietal bones in ancient Egyptians. *J. Anat. & Physiol.*, Lond., 1906–1907, XLI, 232.

[16] *Edin. M. J.*, 1926, n. s. XXXIII, 645–671.

[17] *Med.-Chir. Tr.*, Lond., 1891, LXXIV, 165.

[18] Allbutt, Sir T. C. 1896, I, 776.

In 1894, after fifty-two years' work, he resigned his post of surgeon to Addenbrooke's Hospital, and his health, which had never been good, obviously failed; in 1896 Sir Frederick Treves had to tell him that he had cancer of the cecum and ought to submit to operation. Although he probably realized the nature of his illness and resolved to face it, he never admitted this, firmly declined to be operated upon, and so, gradually getting weaker, was confined to bed for six weeks before he eventually died on September 24, 1896, with intestinal obstruction. His death thus closely followed that of his contemporary, Sir John Eric Erichsen (1818–1896), on September 23, a leader of the surgical profession in London and author of a once well-known surgical textbook. His son, Alfred Paget Humphry, M.A., LL.M., was Esquire Bedell of the University of Cambridge from 1877 to 1913, and was a first-class rifle shot, winning the Queen's Prize of the National Rifle Association in 1871 at the meeting held at Wimbledon (not, as later, at Bisley) when an undergraduate.

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[From Boyle: Opera Omnia.
Venetiis, 1697.]

SIR HUMPHRY DAVY: A SKETCH

By GEORGE C. PECAHEY

LONDON, ENGLAND

In one of the manuscript commonplace books of Mrs. Matthew Baillie, the widow of the famous physician, is found the following note:

In reading the life of Sir Humphry Davy written by Dr. Paris, I have lately been struck with a passage which I cannot but regret because it conveys, to me at least, an erroneous impression of this celebrated person, such an one as I should be sorry to have transmitted of him to posterity. True it is that it relates only to manner, but thus it represents him as being pert, and to me also, and perhaps, for that very reason, as being in a degree vulgar; and this great defect I should be unwilling to suppose in anyone so highly gifted and with such great superiority of intellectual powers. Neither do I think it was actually the case, and much is it to be wished that such a description had not been given in a work so interesting and likely to be so generally read, a work that is, I believe, in general so true, the scientific part of which I can be no judge of, and is said to be so ably given. The passage is as follows: Davy's uncouth appearance and address subjected him to many mortifications on his first arrival in London. There was a smirk on his countenance, and a pertness in his manner, which, although arising from the perfect simplicity of his mind, were considered as indicating an unbecoming confidence. Johnson, the publisher, as many of my readers will probably remember, was in the custom of giving weekly dinners to the more distinguished authors and literary stars of the day. Davy, soon after his appointment (that of Lecturer at the Royal Institution) was invited upon one of these occasions, but the host actually considered it necessary to explain, by way of apology to his company, the motives which had induced him to introduce into their society a person of such humble pretensions.

Now I happened to have an opportunity of meeting this great man at this early period of his life, one day at dinner in the house of Sir George Beaumont, and I will endeavour to describe him as he then appeared to me. He might perhaps at that time be about twenty, but he had then, and during the whole of his life, a very youthful appearance. Rather below than above the middle size, slender in his person, light-brown hair rather longer than it is usually worn, with a fresh and blooming complexion and blushing at every word he uttered and that was addressed to him, he looked like a mere boy, and certainly his extreme bashfulness gave a sort of fidgety restlessness to his manner which was awkward, but not to my judgment either pert or vulgar. It is true that, as it seemed to me from the same cause, there was a degree of habitual smile upon his countenance, and many of the other awkward tricks which so often proceed from shyness, and so often remain even after the shyness which occasioned them may have been removed. In the present instance this is very much the case, for the sort of manner I have been endeavouring to describe continued in a considerable degree with Sir Humphry Davy through his whole life. The general form of his face was not much calculated to convey expression, and there was rather an awkward length and narrowness about the lower part of it; but the eyes were most remarkable, radiant with genius, and the most birght and beaming expression of intellect that can possibly be conceived. They were of a clear and brilliant blue, with a very sweet as well as powerful expression, and when he became warmed and animated in conversation, I think it was impossible to have seen him and have supposed him any ordinary person. This beauty and expression of the eyes have been portrayed in extraordinary manner by Sir Thomas Lawrence in his portrait of Sir Humphry Davy, presented by Lady Davy to the Royal Society after his death. The subject was very difficult, but Sir Thomas Lawrence could triumph over difficulties, and perhaps he has shown himself more especially pre-eminent in giving the expression of the eyes even when so speaking and radiant with intellect, that it would seem almost to require a power more spiritual than human means possess to represent them. [1831.]

JOHN MORGAN, FATHER OF MEDICAL EDUCATION IN NORTH AMERICA*

By WILLIAM SHAINLINE MIDDLETON, M.D.

MADISON, WISCONSIN

> The historian who shall hereafter relate the progress of medical science in America will be deficient in candour and justice if he does not connect the name of Dr. Morgan with that auspicious era in which medicine was first taught, and studied as a science, in this country. (Benjamin Rush.)

EARLY American medical history affords few more striking or illustrious characters than John Morgan. Of brilliant intellect and charming personality, he shines forth among a most learned group of Philadelphia physicians of the ante-Revolutionary days. Honored by virtue of his eminent qualifications by his Alma Mater and later by the Continental Congress, we find the unfortunate conniving hand of conspiracy raised to snatch his merited high offices. Then come years of vain efforts for vindication, which, finally won, fails to bring the anticipated comfort to the prematurely aged master-idealist.

John Morgan was born in Philadelphia in 1735 of Evan and Joanna, or Joan, Biles Morgan. Of his paternal connections, George Morgan, a younger brother of John, wrote in a family Bible. "George Morgan, the son of Evan and grandson of David Morgan, gentlemen of Wales, whose ancestors retired to the mountains rather than be enslaved by William of Normandy, called William the Conquerer." Indeed their Quaker ancestry is said to date "back to the days of Alfred" on the father's side. Morgan's parental grandfather came to America about 1700. Evan Morgan, his father, was a resident of Chester, Pennsylvania, for a time. However his wealth and position were largely attained in Philadelphia. The older Morgan, in addition to his commercial activities, was a man of affairs, being a member of the Board of Managers of Pennsylvania Hospital for two separate terms, a warden of Christ Church for many years and a member of the Pennsylvania Legislature for several years. Evan Morgan was a personal friend and neighbor of Benjamin Franklin, a heritage which later served John Morgan well. We find the elder Morgan characterized as "virtuous, sober, sensible, good."

Joanna Biles Morgan was descended from the most prominent Quaker families of Pennsylvania. Her father, William Biles, settled in Bucks County in 1679, before Penn's arrival, and there surrounded himself with rich estates and considerable power. He was a Quaker leader, the first recorded meeting of Friends in this country being held in his home near Falls of Neshaminy on May 2, 1683. Mrs. Morgan's mother was a Blackshaw, a family likewise prominent in Quaker affairs. Her grandfather, Randall Blackshaw, came to America with William Penn and was present on the occasion of the consummation of Penn's Treaty with the Indians at historic Shackamaxon.

Of the early home life in Philadelphia, we have but little record. The Morgans were a large family and the quiet Quaker charm of the Colonial days seems to have pervaded their lives. The Morgan residence at Second and Market Streets was located in the best residential section of that day. Their social position was assured by their affluence, church and family connections. John was the eldest of this large Morgan family, of

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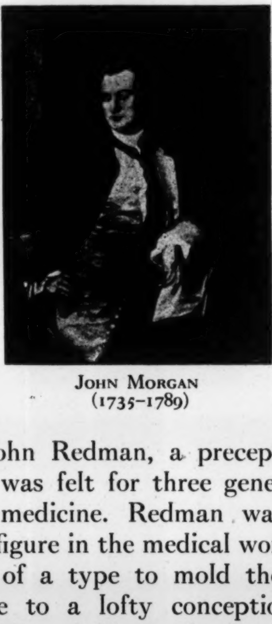
*Read before the Medical History Seminar, University of Wisconsin.

NOTE. Grateful acknowledgement is herewith made for material assistance from Dr. William Pepper and Dr. William Snow Miller in the preparation of this sketch.

whom only two have left descendants. At an early age young Morgan was sent to the renowned Nottingham School, Chester County, Pennsylvania, under the Reverend Mr. Finley, a scholar in Greek and Latin. John Morgan early distinguished himself by his application and unusual ability, so that he was able to enter the Academy and College of Philadelphia in advanced standing. The degree of Bachelor of Arts was conferred on him by that institution with the first graduating class of 1757.

Morgan's medical training dovetailed with his liberal education for several years. From 1750 to 1756 he served as apprentice to Dr. John Redman, a preceptor whose influence was felt for three generations of Colonial medicine. Redman was a commanding figure in the medical world of that day and of a type to mold the brilliant apprentice to a lofty conception of the opportunities of his profession. The last year of this apprenticeship was served as apothecary to the Pennsylvania Hospital. Morgan was the second to hold this position and he resigned May 1, 1756, "having a prospect of business more advantageous than his present employment."



John Morgan
(1735–1789)

His medical education was enlarged by four years' service in the French and Indian Wars. Although commissioned lieutenant April 1, 1758, in the expedition against Fort Duquesne, he acted as surgeon to his detachment. Morgan's signal services at this time attracted the attention and commendation of his commanding officer, General Forbes. Contemporary opinion is preponderantly biased and does not necessarily imply later approval. However, the written sentiment of the great Benjamin Rush seems to have been the prevailing judgment of that period: "So great was his diligence and humanity in attending the sick and wounded who were the subjects of his care, that I well remember to have heard it said that if it were possible for any man to merit Heaven by his good works, Dr. Morgan would deserve it for his faithful attendance upon his patients." The experience gained by his military service in these wars stood him in invaluable stead in the War of the Revolution some sixteen years later.

Succeeding his resignation from the Army five years of fruitful study were spent under the greatest masters of Europe. The friendship of Benjamin Franklin opened the doors of many exclusive English houses to him and his first year spent in London proved most profitable, medically and socially. From the Hunters he learned the art of making anatomical preparations by corrosion, an achievement which in turn paved the way for high honors on the Continent. Armed with letters from Franklin to Lord Kames and Dr. Cullen, John Morgan left London for Edinburgh in 1761. The great number of Americans who completed their medical training at this institution of learning during this period is explained by the strength of her faculty. That Edinburgh should have attracted Morgan and have so impressed him as to have been his model for a medical school in America gave an impetus to the infant seat of learning, Pennsylvania, that was felt for a hundred years. Morgan was graduated in 1763 with the degree of Doctor of Medicine. His thesis, "De Puopoiesi," was a masterly contribution and the theory he advanced therein of the true secretion of pus from the blood vessels in certain inflammatory conditions was revolutionary in thought. As expressed in the thesis, his belief was: "Hoc mea speciale habet, pus nempe neque in sanguine neque extra vasi generari, sed in ipsis vasis inflammatis, et vasorum mutationes ab inflammatione inductas, esse causas efficientes quae virtute quadam secretoria, pus a sanguine eliciunt." Priority over Hunter for this theory was given to John Morgan in 1817 by Curry, a teacher of anatomy in Guy's Hospital who had made a special study of the question. A century later Cohnheim demonstrated beyond equivocation the truth of Morgan's theory.

Of Morgan's graduation, we learn that it was the occasion of "an éclat almost unknown before." Surrounded by a circle of admiring friends, he was clearly the lion of the hour, and his promise for a brilliant future received an incredibly wide circulation. A valuable and life-long friend in the person of Dr. Cullen wielded a powerful influence on him both as a student and as a practitioner. Morgan's correspondence with Cullen bears a note of filial devotion and apparent intimate understanding. Reciprocally, we find in a biography of Cullen (1832) that "Mr. Morgan appears to have fully realized the expectations of his friend Dr. Franklin."

Morgan left Edinburgh for Paris late in 1763. His demonstration of the corrosion method of the preparation of tissues before the Académie Royale de Chirurgie de Paris created a profound impression and the comments on his work were very favorable. His stay in Paris was largely occupied in the study of anatomy under M. Sue, and it was not until later, while in Italy, that he learned of his election to a corresponding membership in the Académie Royale, July 5, 1764. From Paris Morgan started on a tour through Switzerland and Italy accompanied by his friend, Samuel Powel, of Philadelphia. "The Journal of Dr. John Morgan, of Philadelphia—Rome to London 1764" is a diary of the trip written in the quaint style and English of the period. He has recorded his impressions of the wonderful art of the countries visited in a manner indicative of a working knowledge of painting and architecture. Several amusing incidents related show his human interest. In the Casa Sancta at Loretto, his inquisitive nature questioned the validity of the miraculous butt, from which three wines were produced. The priest refused to allow him to examine the container. Whereat, commenting on the difference, Morgan records: "In the Col'r they were so, but all agreed in one Quality, i.e., of being sower; w'ch made me think the Madonna not so much anxious of commending the goodness of the Wine as the Nature of the Miracle." He found the conditions of medical education in Italy most deplorable. He inspected hospitals at every opportunity with a view to applying this knowledge in America. The Alps and the wonderful Italian scenery appealed to his artistic taste. His practical bent found much to absorb his attention in such details as pavements, streets and the fortifications at various points. Morgan obtained audience with the King of Sardinia, the Pope, Voltaire and many other celebrities. A diplomatic bout with the Italian customs officer at Buffalora gave rise to the following interesting remark: "A Physician who appears before his Patient in a plain Manner with a common Apparel, in the eyes of the World must be ignorant of his Profession, whilst one with a monstrous Paraphernalia of dress, enormous wig & grimace, is esteem'd a second Hippocrates."

Two acquaintanceships on this journey were of more than passing importance. At Padua, Morgan visited Morgagni, the celebrated light of Italian medicine of that time. Morgan again demonstrated the corrosion method. Evidently, Morgagni was properly impressed with the personality of the young American, entertaining him most hospitably and from the similarity of their names claiming relationship with him. Tradition recounts that the venerable Morgagni, then eighty-two years old, was so grateful for the gift of Morgan's thesis that he reciprocated by giving Morgan his recent work, "De Sedibus et Causis Morborum," inscribing in his own hand on a blank page the following: "Affini suo, medico praeclarissimo Johann Morgan, donat auctor." These volumes were placed in the Library of the College of Physicians of Philadelphia by Morgan, and historical accuracy exacts a correction of the above pretty compliment. On the title page of the first volume is inscribed: "Viro experientissimo et humanissimo D. Di Joanni Morgan Auctor," while in the second volume: "Viro de Re Anatomico bene merito Do. Dr. Joanni Morgan Auctor." While kinship is not avowed in the authentic inscriptions, assuredly a higher appreciation of the medical attainments of Morgan is implied than in the conventional legendary form.

The reception of the American tourists, Morgan and Powel, by Voltaire at Chateau de Ferney was characteristic of that philosopher's regard for English-speaking people. After a delightful call, on their departure Voltaire called after them: "Behold two Amiable Young Men, Lovers of Truth & Inquirers into Nature. They are not satisfy'd with near Appearances, they love investigation & Truth & despise Superstition—I commend You Gentlemen—go on, love Truth and Search diligently after it. Hate Hypocrisy. Hate Masses & above all hate the Priests."

A medical annotation, which should more especially interest inhabitants of Wisconsin, embodies the then accepted explanation of endemic goiter:

> In this Country [Turin] I could not but take notice of the tumidum Guttur Alpinum w'ch Horace mentions. It is said to be a Disease arising amongst poor people from their drinking snow Water. It is a sad sight when got to any considerable Degree. Some I saw who had a Swelling on their Throats & Necks as large as their Heads, projecting forw'd & some hanging down an enormous Weight or rising up so as to entirely cover one side of their faces, a most shocking sight.

Obviously the source of endemic goiter was recognized at that time, but the *modus operandi* was unknown.

John Morgan, returning to Paris, took his seat in the Académie Royale on October 4, 1764. While in Paris at this time Morgan corresponded with Shippen and prepared his memorable "Discourse on the Institution of Medical Schools in America" under the critical eye of Samuel Powel. In fact, during practically the entire fall and later winter, spent in England on account of the heavy seas, Morgan was carefully planning each step for the realization of his early hope, the first medical school in North America, to be founded in Philadelphia. In addition, he was enlisting the support of the most influential physicians and laymen of England in his project. Dr. John Fothergill, who had furnished much material in the way of charts, models, and so forth to Pennsylvania Hospital for anatomical study under William Shippen, Jr., was hearty in his support of Morgan's plan and probably his name, as a prominent Quaker, carried more weight in the Colony than did those of Hunter and Watson, who likewise indorsed the idea. In a letter to James Pemberton, dated April, 1761, after outlining Shippen's plan for anatomical teaching, Fothergill continues that Shippen "will soon be followed by an able assistant, Dr. Morgan, both of whom, I apprehend, will not only be useful to the Province in their employments, but if suitably countenanced by the Legislature, will be able to erect a School of Physic amongst you, that may draw students from various parts of America and the West Indies, and at least furnish them with a better idea of the rudiments of their Profession than they have at present the means of acquiring on your side of the water." Truly this was a prophecy and a high estimate of the qualifications of the men who planned to undertake the work of medical education in America. Thomas Penn and two former members of the Board of Trustees gave Morgan's plan their sanction.

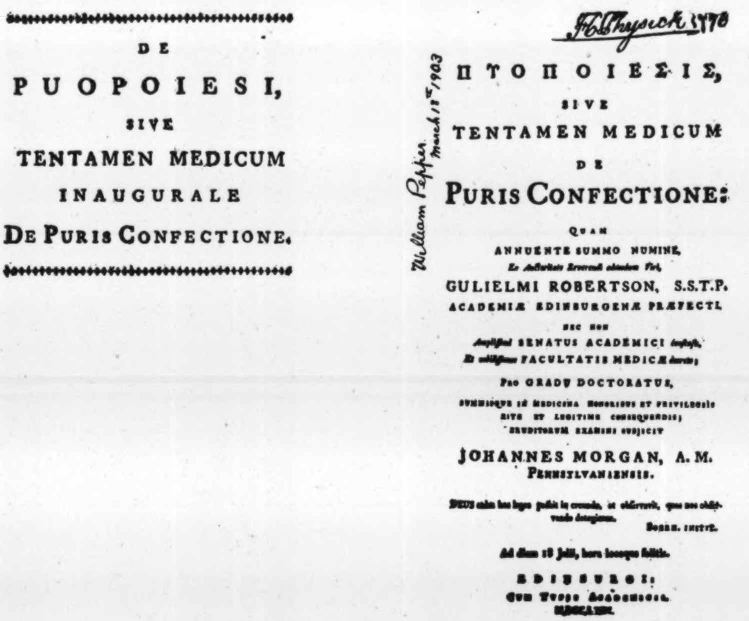
In his farewell letter to Dr. Cullen before leaving for America, Morgan wrote: "I am now preparing for America, to see whether, after fourteen years' devotion to medicine, I can get my living without turning apothecary or practising surgery. My scheme of instituting lectures you will hereafter know more of. It is not prudent to broach designs prematurely; and mine are not yet fully ripe for execution." Turning his back to an outlook for a brilliant future in Europe, Morgan still adhered to his well-formulated plan. The situation is expressed in a contemporary letter from Powel to a Philadelphian: "Pray, use him as his merits deserve and don't force him from you. For the honor of our country make his residence with you agreeable. It is no small sacrifice he makes in returning, as fine prospects open upon him here if he would stay; but his Amor Patriae maintains the upper hand." He arrived in Philadelphia in the spring of 1765.

The transplantation of Morgan loaded with his Continental honors, licentiate of the Royal Colleges of Physicians at Edinburgh and London, Fellow of the Royal Society, member of the Belles Lettres Society of Rome and associate of the Académie Royale de Chirurgie de Paris, to provincial America is most interesting and contemporary comment is noteworthy. Writing to Samuel Powel, George Roberts said: "Morgan comes home flushed with honors and is treated by his friends with all due respect to his merit. He appears to be the same social friendly man, not assuming the solemn badge so accustomed to a son of Aesculapius." On his return home he was regarded as having some of the "eccentricities of genius." Benjamin Rush writes that he was received in open arms. Norris, a later writer, states that in point of learning and experience Morgan was the best medical man in the Province; that a fine reputation had preceded him and great things were expected of him. Indeed, so great was his fame on his return home that it was deemed a privilege to say: "I have seen him."

An attractive personality must have been a large factor in giving such prestige to so young a physician as John Morgan. He was described as being charming and polished in manner and of distinguished bearing. In addition, he was well dressed and handsome. It is a well-established tradition in Philadelphia that he carried the first umbrella in America and for some time crowds followed him on the streets. Morgan's innovation was widely scouted as an "effeminacy." However, Dr. Chanceller and Parson Duché joined him in a short time in the use of a sun umbrella. Portraits and descriptions of that period paint for us a rather dapper, intellectual, handsome young Colonial gentleman.

Of his family affairs we learn that Morgan became engaged to Mary, daughter of Thomas and sister of Francis Hopkinson, just prior to sailing for Europe or during his residence there. An incident of Morgan's journey in Italy, when he went to the extreme to save a miniature, "w'ch I [Morgan] valued above anything else I had there," would seem to indicate his engagement prior to the voyage. From this miniature, Benjamin West painted a portrait, which is still in the possession of the Hopkinson family in Baltimore. September 4, 1765, Morgan was wedded to Miss Hopkinson. Although no issue resulted from their marriage, happiness seems to have reigned throughout their life together. She was characterized as a woman of extraordinary charm of character, disposition and manner. She was a witty conversationalist and a musician of no mean note. She was graceful, unaffected, vivacious and fascinating, in a word, a woman of unusual social attainments. From even a most superficial consideration she was a remarkable mate for the brilliant, sympathetic amiable Morgan.

Immediately on Morgan's arrival in America he set out to consummate his plans for establishing systematic medical education. William Shippen, Jr., about whom Fothergill wrote the trustees of Pennsylvania Hospital in regard to the institution of anatomical teaching, had corresponded with John Morgan in Europe on this subject; but accurate documentary evidence is available in proof of the difference in the aims of the two men. Shippen had from November 25, 1762,[1] been giving lectures in anatomy in Fourth Street, and by some this is believed to have been the beginning of the Medical Department of the University of Pennsylvania. However, we find no evidence of a systematic correlated course of complete medical instruction in Shippen's early teaching or plans for the same in his writings. The plan of establishment of a medical school in affiliation with the College of Philadelphia was clearly the product of the fertile constructive mind of John Morgan, and its early and assured success was largely dependent on his personal ability and untiring efforts.



DE
PUOPOIESI,
SIVE
TENTAMEN MEDICUM
INAUGURALE
De Puris Confectione.

F. S. Physick 1778
William Pepper March 18th 1903

ΠΥΟΠΟΙΕΣΙΣ,
SIVE
TENTAMEN MEDICUM
DE
Puris Confectione:
Quam
ANNUENTE SUMMO NUMINE,
GULIELMI ROBERTSON, S.S.T.P.
ACADEMIÆ EDINBURGENÆ PRÆFECTI,
NEC NON
SENATUS ACADEMICI
FACULTATIS MEDICÆ
Pro GRADU DOCTORATUS,
SUMMISQUE in MEDICINA HONORIBUS ET PRIVILEGIIS
RITE ET LEGITIME CONSEQUENDIS;
ERUDITORUM EXAMINI SUBJICIT
JOHANNES MORGAN, A.M.
Pennsylvaniensis.

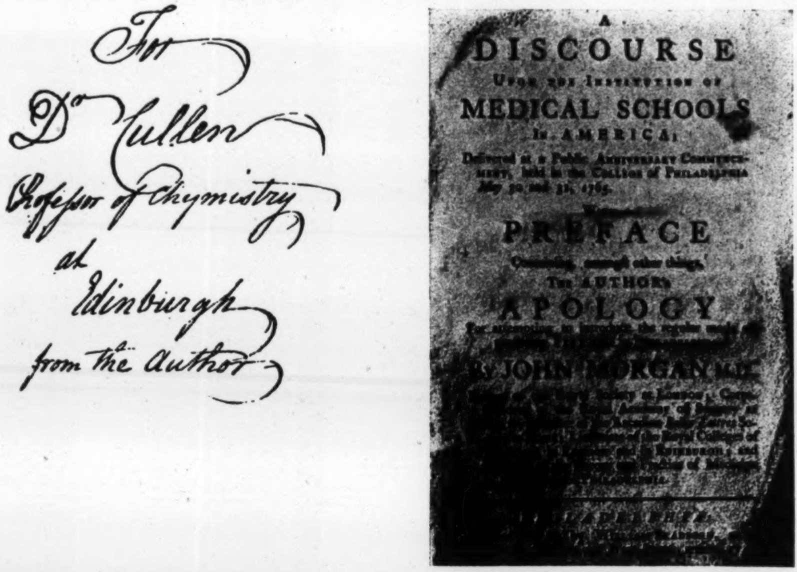
Ad diem 18 Julii, hora locoque solitis.

EDINBURGI:
Cum Typis Academicis.

Title Page of Morgan's Thesis.

A moment in passing must be devoted to a consideration of the essential character of William Shippen, Jr., who played so great a part in Morgan's life. Having so much in common in ambitions and so little in common in personalities, these two men were destined to be at first close friends but later, bitter rivals. Shippen was a year younger, but graduated from Edinburgh a year earlier. His training and preparation were neither as long nor as exacting as John Morgan's. Shippen is described as calm, cautious, far-seeing and self-possessed, qualities that made for leadership, but which were unfortunately at times subservient to a crafty designing nature. Morgan, by way of comparison, was impulsive, fervent and positive and combined in his makeup all the highest qualities of a statesman-like organizer. Time has largely effaced or overlooked the radical differences between these men, but unfortunately we are compelled to chronicle their years of successful cooperation followed by a period of suspicion, strife and actual hatred.

Returning to the events leading up to the foundation of the medical school, we find Morgan actively engaged in the agitation of his proposition. He located in practice at Second and Spruce Streets and, contrary to the custom of the day, divorced surgery and pharmacy from medicine. He was the first man in America to practice medicine exclusively by choice. The reasons for advancing this plan of procedure were to enable the busy practitioner to devote his time to practice and research, the different qualifications for the three divisions of the existing medical practice and the benefit to the patient of specialization on the part of the physician. The existing conditions of medical practice and the relief to be gained by his plan of specialization are detailed in the "Discourse." To further his plan of the separation of medicine from pharmacy, he brought with him from London Mr. David Leighton, an accomplished pharmacist and surgeon. Then, too, Morgan instituted the English plan of charging a definite fee at each visit, which failed to meet with popular approval.



For
Dr Cullen
Professor of Chymistry
at
Edinburgh
from the Author

A
DISCOURSE
Upon the Institution of
MEDICAL SCHOOLS
In AMERICA;
Delivered at a Public Anniversary Commencement, held in the College of Philadelphia May 30 and 31, 1765.
With a
PREFACE
Containing, amongst other things,
The AUTHOR's
APOLOGY
For attempting to introduce the regular mode of [illegible]
By JOHN MORGAN M.D.
[illegible]
PHILADELPHIA:
[illegible]

TITLE PAGE AND INSCRIPTION OF MORGAN'S INAUGURAL DISCOURSE.

The response of the Board of Trustees of the College of Philadelphia to Morgan's appeal for medical instruction in that school was encouraging: "Entertaining a high sense of Dr. Morgan's abilities and the high honors paid to him by different learned bodies and societies of Europe, they unanimously elected him Professor of the Theory and Practice of Physic." The first medical professorship in North America was thus established May 3, 1765. Morgan's task was somewhat facilitated by the fact that, of the twenty-four trustees of the College in 1765, Thomas and Phineas Bond, Thomas Cadwalader, William Shippen, Sr., and John Redman were doctors of medicine.

On May 30, 1765, Dr. John Morgan delivered his memorable Inaugural Address at the Commencement of the College, "A Discourse upon the Institution of Medical Schools in America." The essay is not only a masterpiece of English literature, but its logic is forceful and its subject matter indicative of clear insight and foresight. Indeed, even though years have altered certain phases of medical practice, yet none of the force of argument has been lost by time. It is a production worthy of careful perusal by every medical man, and Norris writes:

> A remarkable production, and should be republished and circulated as an act of justice to his memory. Although the science has advanced immeasurably since that day, his enlarged views of what is required of a medical practitioner by preliminary education, his high-toned sentiments regarding its practice, honors and emoluments, his recommendations

of clinical teaching and hospital instruction, his recital of the years of labor spent by him in preparation for his active duties, in addition to its historical value, all make this now very rare tract worthy of such attention.

Morgan clearly presents the advantages of the influx of students from distant parts to Philadelphia, then a town of 25,000 and the center of culture of the Colonies. He demonstrates the necessity to medicine for a coalition of able teachers for a regular course of instruction. He shows how even at that time students were attracted to Philadelphia by the reputation of its physicians and the facilities for hospital work.

Regarding medical education, Morgan makes the following divisions: "Anatomy, Materia Medica, Botany, Chymistry, the Theory of Medicine and the Practice." Several expressions and quotations are noteworthy:

> It is Anatomy that guides the doubtful steps of the young votary of medicine through an obscure labyrinth, where a variety of minute objects present themselves in such a group as, at first, to perplex his imagination. . . .
>
> As a skillful Pilot informs himself of the least bank of sand or shoal where he is to avoid navigating his ship; so every follower of medical pursuits should be intelligent in the minutiae of Anatomy, if he wishes to practice with ease to himself, and to the benefit of his patient. . . .
>
> Anatomy, Materia Medica, Botany, Chymistry, and the Institutions, are only the ladder by which we are to mount up to practice.

A man is obviously unable to prepare for practice without the assistance of teachers and Dr. Morgan dramatically draws the picture of an unprepared practitioner, ignorant, irresolute, interfering with Nature, snatching away loved ones: "Remorseless foe to mankind: actuated by more than savage cruelty: hold, hold thy exterminating hand." The restraining, ambition-kindling, guiding duties of the teacher are well painted. "Destitute of culture, the imagination of youth shoots wild and unprofitable: but, directed by art and improved by science, a natural genius is like a rich soil, the fruitful source of many benefits to a country."

In the light of subsequent developments, the following extract from his address would almost grant Morgan the power of prophecy:

> Perhaps this Medical Institution, the first of its kind in America, though small in its beginning, may receive a constant increase of strength and annually exert new vigor. It may collect a number of young persons of more than ordinary abilities, and so improve their knowledge as to spread its reputation to distant parts. By sending these abroad duly qualified, or by exciting an emulation amongst men of parts and literature, it may give birth to other useful institutions of a similar nature, or occasional rise, by its example, to numerous societies of different kinds calculated to spread the light of knowledge through the whole American continent wherever inhabitated.

Over the main entrance to the new medical laboratories at the University of Pennsylvania are engraved the names of the first complete medical faculty grouped in this manner: Morgan and Rush, Shippen and Kuhn, an arrangement which subsequent events have rendered most happy. William Shippen, Jr., was appointed to the professorship of anatomy and surgery in September, 1765, at the earnest solicitation of Dr. Morgan and on his (Shippen's) personal application. It is in this application that we see Shippen's cherished plans and learn of his correspondence with Morgan in England. Morgan and Shippen constituted the faculty of the first session of the young medical school; Kuhn was added to the faculty in the capacity of professor of materia medica and botany in January, 1768, and Benjamin Rush, a young protégé of Morgan, was elected professor of chemistry in 1769. A tablet in the main hall of the medical laboratories at Pennsylvania commemorates the foundation of the Medical School:

Erected
to the
Memory
of
John Morgan, M.D., Edin.
William Shippen, M.D., Edin.
The First Faculty
of This
The First Medical School
in
North America
1765
Erected by the Medical Class
of 1907
June 19, 1907

The first session of the new school opened on Monday, November 18, 1765[2] with Dr. Morgan's lectures on materia medica, pharmaceutic chemistry and, time permitting, "Practical Observations on Diseases, Diet and Medicines." This course, meeting three days a week, lasted three or four months and was supposed to be the introductory course to that of the succeeding year, which included the theory and practice of physic.[3] On June 21, 1768, the first medical honors in North America were conferred on ten graduates from the Medical School, the degree being M.B. The Medical School of King's College, which has erroneously by certain writers been given priority over Pennsylvania, was not organized until 1768 and was disbanded during the Revolutionary period up to 1792, when Columbia College took the place of the older school.

The support of Dr. Thomas Bond, a famous Philadelphian of the day, was early and continuously added to the new work, and his clinical lectures in the Pennsylvania Hospital formed an important supplement to the work of Morgan and Shippen. In an address, December 3, 1766, Bond stated: "The Professor of the Theory and Practice of Physic has had the best opportunities of improvement, joined to genius and application, and cannot fail of giving necessary and instructive lessons to the pupils." The young school grew rapidly and was well supported in the matter of attendance. The need for funds, however, constituted a real menace to its progress. To meet this issue, Dr. Morgan at his own expense, bearing the sanction of Richard Penn, went to the British West Indies in 1772. By virtue of his appeal 2,000 pounds sterling were brought back to Philadelphia. However, his teaching was deferred for this year.

The session of 1769–1770 was notable for the youth of the faculty of the Medical School. Thomas Bond (Clinical Medicine) was the oldest, fifty years of age; John Morgan (Theory and Practice of Medicine) was thirty-four; William Shippen, Jr., (Anatomy, Surgery and Midwifery) was thirty-three, Adam Kuhn (Materia Medica and Botany) twenty-eight, and the gifted Benjamin Rush, holding the chair of chemistry, had attained the venerable age of twenty-four. The session ending June, 1771, marked the granting of the first doctorate degree in medicine at the Medical College. Four of the men receiving their primary degree of M.B. in 1768: Jonathan Potts, James Tilton, Nicholas Way and Jonathan Elmer, were thus honored.

The period between Morgan's return to America in 1765 and the Revolutionary War was one of great constructive and organizing activity on his part. In addition to his efforts to establish a medical school, the first medical society in America was founded in 1765 in Philadelphia under his guiding hand. Of this society we have little record. Morgan helped to establish the American Philosophical Society and was active in its proceedings. Another of his favored plans, the College of Physicians of Philadelphia, did not materialize until 1787. On a marble slab in the entrance hall of the present College of Physicians, we find engraved the names of its founders and with Morgan's name those of Hutchinson, Cadwalader, Redman, Chovet and others of equal fame are set.

Dr. Morgan was cultured in the humanities as well as trained in the sciences, and his literary ability is attested by the Sargent

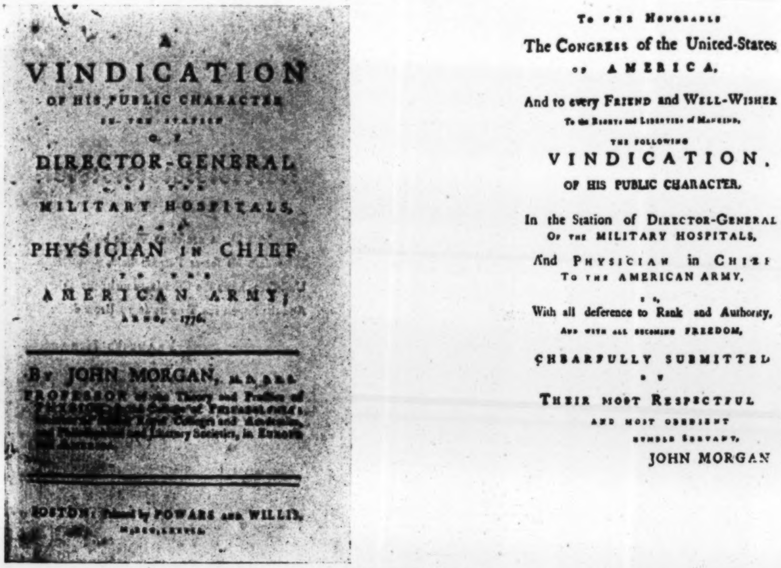
Prize Medal contest,[4] which he won over a field of notable competitors with an essay on "The Reciprocal Advantages of a Perpetual Union between Great Britain and her American Colonies." The dissertation, which was read at the Commencement of the College of Philadelphia, May 20, 1766, is extremely well written, and one is at loss to know whether its brilliancy or logic influenced the judges more. At any rate, the victory was an enviable one for the young professor. His plan of treating the question is unique, on the basis of commerce and the advancement of the Protestant religion. Carefully he prepares the plea of the Colonies and the obligations of the Motherland. With equal care he outlines the dependence of America on England. He shows a deep knowledge of the commercial products of the young country and the mutual advantages of their use to both parties concerned. With clear insight Morgan points out the weakness of England's geographical situation and the necessity of commerce to her very existence. The growth of England's shipping with the establishment of trade with the Colonies is pictured. The Colonies' part in wars with France and Spain makes them invaluable in event of such occurrences in the future. However, he does not underestimate the debt of the Colonies to England. But, he states:

> If the superstructure of a government be raised on any other foundation than the general interest of the whole community, it cannot be durable. Like the image of Daniel's vision, the head whereof was of fine gold, the belly and thighs of brass, the legs of iron, and the feet part of iron and part of clay, which cannot cleave together, it must, when smote upon, be broken to pieces. But the constitution of a country, in which the happiness of a whole community is regarded, is like a firm oak that withstands the fury of the jarring elements, raised up in a storm, fixes its roots deeper in its native earth and lifts its majestic head to the skies.

The whole essay constitutes an eloquent appeal for the continued reciprocal advantages of the union between the American Colonies and Great Britain, but the keynote of warning to the Mother Country is not lacking.

The war cloud, which had been temporarily dispelled at the time of the writing of the dissertation, again gathered, and in 1775 and 1776 the Colonies engaged England in a revolutionary struggle. With it came first the highest medical honors in the land to Dr. Morgan, only to terminate in the darkest disappointment of his life. The fortunes of the Medical Department of the Continental Army were first intrusted to Dr. Church, who betrayed his trust by traitorous correspondence with the British. Dr. John Morgan was appointed by Congress in October, 1775, to fill the vacancy. His title was Director-General to the Military Hospitals and Physician-in-Chief to the American Army, and he was the first to be so honored. Of his qualifications there seems to have been no doubt: "His ability as a surgeon, his character as a man, his patriotism, and his influence as a citizen were well known to the public. Therefore no more fitting appointment of Chief Medical Officer could have been made." John Adams in a letter to Abigail Adams, October 20, 1775, commented on the fall of Dr. Church, enlarging on the qualifications of his successor, Dr. Morgan. However, Adams scented jealousy, but added that "all agree that he is attentive, vigilant and laborious for the good of his patients in a great degree and he is said to be pious man." Leaving an admiring group of followers and a lucrative practice in Philadelphia, Dr. Morgan with Mrs. Morgan joined Washington and the Continental Army in Cambridge. In view of subsequent events, his sacrifice was great. Patriotism was the motive in his acceptance. Probably in no position or undertaking did the wonderful organizing genius of John Morgan show to a greater advantage than in the new medical department of the Army. Morgan found the corps disorganized and jealous. The hospital system was poor and the difficulties in obtaining funds and supplies were almost insurmountable. However, had Morgan's task been confined to the organization of the staff and the construction of an efficient hospital system, no doubt another success would have crowned his efforts; but his real problem was to combat an invisible force of intrigue working for his removal from office. The keynote of this underhanded campaign is struck in his "Vindication," a pamphlet advancing the details of the controversy which ended in his dismissal: "That a mean and invidious set of men have looked upon my elevation to the rank of Director-General and Physician-in-Chief, with an evil eye, and long been concerting my removal is a matter of which I have too substantial proof to doubt." To enter into the details of this unfortunate controversy would be tedious. The major events as chronicled in the "Vindication" are matters of historical importance.

In the beginning Dr. Morgan's duties were ill defined, and at the very onset we find friction with Dr. Stringer of the Northern Army, who refused to recognize Morgan's superiority of office. The greatest strife came from Morgan's confiscation of drugs and supplies in Boston. As nearly as can be determined, this act brought much criticism on his head, and in turn led the regimental surgeons to expect their supplies from the General Hospital, of which Morgan had immediate supervision. The Director-General's efforts to organize the regimental medical forces and to correlate the work of the two staffs were misconstrued and resisted on all hands. Handicapped by insubordination, improper and inadequate assistance and supplies, Morgan overcame great difficulties during his short term of office. In answer to his critics, he offered public explanation and earnestly sought an audience with Congress to prove the wisdom of his plans. To add to his ignominy his colleague, William Shippen, Jr., who but a few months before had asked his advice on the "etiquette" of the service he was about to enter, loomed up as the head of the political faction seeking Morgan's removal. Congress went so far as to elevate Shippen to and even above Morgan's position. Shippen in turn ungraciously demanded the surrender to his command of all hospitals and staff west of the Hudson,



A
VINDICATION
OF HIS PUBLIC CHARACTER
IN THE STATION
OF
DIRECTOR-GENERAL
OF THE
MILITARY HOSPITALS,
AND
PHYSICIAN IN CHIEF
TO THE
AMERICAN ARMY;
ANNO, 1776.

BY JOHN MORGAN, M.D. F.R.S.
PROFESSOR of the Theory and Practice of
[illegible] Colleges and Academies,
[illegible] Literary Societies, in EUROPE
[illegible]

BOSTON: Printed by POWARS AND WILLIS,
M,DCC,LXXVII.

To THE HONORABLE
The CONGRESS of the United-States
OF AMERICA.

And to every FRIEND and WELL-WISHER
To the RIGHTS and LIBERTIES of MANKIND,

THE FOLLOWING
VINDICATION,
OF HIS PUBLIC CHARACTER,

In the Station of DIRECTOR-GENERAL
OF THE MILITARY HOSPITALS,
And PHYSICIAN in CHIEF
TO THE AMERICAN ARMY,

IS,
With all deference to Rank and Authority,
AND WITH ALL BECOMING FREEDOM,

CHEARFULLY SUBMITTED
BY
THEIR MOST RESPECTFUL
AND MOST OBEDIENT
HUMBLE SERVANT,
JOHN MORGAN

TITLE PAGES OF THE VINDICATION.

and was upheld by Congress. Morgan still resented only the shifting of titles without the transference of the responsibility to the proper shoulders. With the inevitable in sight Morgan refused to resign under fire. In Congress he was refused a hearing and found himself held responsible for all of Shippen's mismanagement with no credit for his own services. Returning to his degraded position, in charge of the medical corps east of the Hudson River, Doctor Morgan received his order of dismissal from Congress in John Hancock's writing, January 9, 1777.

"If it would have answered any valuable purpose; if the sacrifice of my life would have saved my Country, I could have cheerfully offered it up. I shall not say so of my honor."

Then came the period of great disappointment and prolonged travail in Morgan's efforts to clear himself of the dishonor. Investigation revealed no definite charge and overzealousness seemed in the last analysis of the current rumors to have been the chief fault expressed. However, not until two years later, June 13, 1779, was Morgan entirely exonerated from all blame by Congress. It is interesting to note that no charges were made to the Congressional committee. Throughout the years of struggle for honor and justice George Washington and Benjamin Rush were Morgan's most ardent supporters.

With vindication apparently came the desire for retribution. For Morgan sought to incriminate Shippen. The "Remembrancer of Christopher Marshall" bears witness that he waged an unequal quarrel. For example in January, 1780, Morgan visited Marshall at Lancaster to obtain affadavits relative to Shippen's conduct of the sick. Under the dates of April 28 and 29 two important self-explanatory notes were made:

> 28. Just going to bed, past ten, came Dr. John Morgan and the Under Sheriff, who had been after him to Ephrata, having a writ against him in the suit of Dr. Houston for slander of him, it's said, in the time of the flying camp. I proposed that if the officer would leave him here, I would deliver him up in the morning, but the Doctor chose to go down to Adam Reigart's. So they went away before eleven.
>
> 29. Returned to dinner. In the interim Dr. Morgan called; said he had been bailed for ten thousand [dollars] by Col. Atlee; thanked my wife for our civilities with his compliments to me, he being just going to pursue the cross-examination with Dr. Shippen in the sundry different places. At dinner, came Dr. Houston. By his coming and conversation, I thought he was conscious that his conduct with Morgan was censurable, which, in conversation, I let him know was mine and many others' judgment on this occasion, it appearing to them as a scheme of Dr. Shippen to prevent his proceedings and therefore altered the minds of sundry of Dr. Shippen's friends, who were in his favor and interest before this action, being so glaring and fraught with malice and ill will

On the resumption of the work at the Medical School, John Morgan and Benjamin Rush, who had resigned from directorship of the Middle Department to escape the fate of his friend, importuned the Board not to reappoint Shippen. In fact, February 28, 1781, they refused to act on the same faculty. However, all were re-elected in the hope of restoring harmony. Morgan did not actively serve in the capacity of Professor of Practice, although the position was held open until the year before his death. An entry in the Minutes of the Board, March 13, 1789, bearing on this point is interesting:

> Dr. John Morgan, Professor of Theory and Practice of Physic, not being at present within the State, the Trustees consider him re-instated and entitled to continue in his office until his return home, when he is to be waited on by the Committee in like manner as the other Professors have been, in order to know whether it is his intention to resume the exercise of his Professorship as heretofore.

Another of Dr. Morgan's official connections was terminated by his resignation from the staff of the Pennsylvania Hospital, May 24, 1783. An action concerning the admission of venereal cases to the hospital on a free basis was resented by Morgan and others, who had not been consulted in the matter. In the records of the Almshouse (Philadelphia General Hospital) it is learned that Morgan had been in the habit of transferring luetic patients to Pennsylvania Hospital for salivation. In his letter of resignation Morgan stated that "to devote their time or attention to the Cure of Diseases brought on by Concupiscence, without fee or reward, tends rather to the growth than diminution of Immorality." In conclusion, Morgan assured the Board of his continued support. It was characteristic that John Morgan, though in later life frequently rebuffed, never became embittered.

The medical literature of that period shows a surprising paucity of medical writings by Dr. Morgan. The fires at Bordentown and Danbury destroyed all of Morgan's personal effects and with these many of his medical manuscripts, the result of ten years' labor. However, the surviving medical papers show the hand of a master. His graduation thesis, "De Puopoiesi," is the best known of his writings and deservedly so for its original thought. His article, "Art of Making Anatomical Preparations by Corrosion," describes the steps of the technique of wax impregnation and later corrosion, an art taught him by the Hunters, who in turn had learned it from Dr. Nicolls. One of his most interesting medical writings is found in the *Transactions of the American Philosophical Society* (II, 383), being an account of "a living snake in a horse's eye, and of other unusual productions of animals." It constitutes an accurate description of a living filaria in the eye of a horse on exhibition in Arch Street between Sixth and Seventh Streets. Morgan does not discuss the possible path of entry. He mentions cases of guinea worm (*Filaria medinensis*) at Philadelphia Hospital and refers to a worm, seen in Dr. William Hunter's museum ten years previously, having been "bred in the liver of Mrs. Holt in this city about thirty years ago." Another article supporting inoculation against smallpox is little known. His "Discourse upon the Institution of Medical Schools in America" and the "Vindication of His Public Character in the Station of Director-General of the Military Hospitals" are probably his best productions from a historical viewpoint.

Dr. Morgan died on October 15, 1789, at fifty-four years of age, and was buried in St. Peter's Church, Philadelphia. The controversy, which ended in his complete vindication, had prematurely aged him and deprived posterity of much of the genius of a man who is ranked with Benjamin Rush as the most interesting character in Philadelphia medicine. John Morgan will ever remain to all Pennsylvania men and to all students of medical history, the father of medical education in North America. As monuments to his creative genius we see the College of Physicians of Philadelphia and the Medical Department of the University of Pennsylvania. "De Puopoiesi" stands forth as a glowing tribute to his original thought. John Morgan's life will for all time stand out clearly as a career, brilliant in promise and early accomplishment, sacrificed to feed the insatiable flames of envy and intrigue, which so marred the records of our struggle for independence. Pennsylvania has been rather frugal in the bestowal of honors on her creating genius but everywhere in her halls we find tokens of her growing appreciation culminating in the recent fusion of her large undergraduate medical societies into the John Morgan Medical Society.

REFERENCES

1. *Pennsylvania Gazette*, Nov. 25, 1726: "Dr. Shippen's Anatomical Lectures will begin to-morrow evening, at six o'clock, at his father's house in Fourth Street. Tickets for the course to be had of the Doctor, at five Pistoles each, and any gentlemen who incline to see the subject prepared for the lecture and learn the art of Dissecting, Injections, &c, are to pay five Pistoles more."

2. *Pennsylvania Gazette*, Sept. 26, 1765: "A course

of Lectures on the Materia Medica, by John Morgan, M.D., F.R.S., and Professor of Medicine in the College of Philadelphia. Price, Four Pistoles.

"This Course will commence on Monday, the 16th day of November, and be given three times a week, at the College, viz., Mondays, Wednesdays and Fridays, at three o'clock in the afternoon, till finished, which will last between three and four months.

"To render these lectures as instructive as possible to students of Physic the Doctor proposes, in the course of them, to give some useful Observations on Medicine in general, and the proper manner of conducting the study of Physic. The authors to be read in the Materia Medica will be pointed out. The various Substances made use of in Medicine will be reduced under Classes suited to the principal indications in the cure of Diseases. Similar virtues in different Plants, and their comparative powers will be treated of and an Enquiry made into the different Methods which have been used in discovering the Qualities of Medicines, the virtues of the most efficacious will be particularly insisted upon; the manner of preparing and combining them will be shown by some instructive Lessons upon Pharmaceutic Chemistry. This will open to students a general Idea both of Chemistry and Pharmacy. To prepare them more effectually for understanding the art of prescribing with Elegance and Propriety, if time allows, it is proposed to include in this course some critical Lectures upon the Chief Preparations contained in the Dispensatories of the Royal College of Physicians at London and Edinburgh. The whole will be illustrated with many useful Practical Observations on Diseases, Diet and Medicines.

"No person will be admitted without a Ticket for the whole course. Those who propose to attend this course are desired to apply to the Doctor for Tickets, at least a week before the Lectures begin. A Dollar will be required of each student, to matriculate, which will be applied in purchasing Books for a Medical Library in the College for the Benefit of the Medical Students.

John Morgan.

P. S. Two convenient lower stores to be let by Dr. Morgan, under his dwelling on Water Street, near Walnut Street, where Mr. Mease lately lived, at a very reasonable rate."

3. September 25, 1766, Dr. Morgan announced: "A Course of Lectures on the Theory and Practice of Physic will be delivered for the benefit of Medical students, with a preparatory course on Botany, Chemistry, and the Materia Medica, being the substance of a set of lectures delivered to his pupils last winter."

4. Advertisement appearing in *Pennsylvania Gazette:*

"College of Phila., March 6th, 1766.

"Whereas, John Sargent, Esq., Merchant of London and Member of Parliment, hath presented to this College a Gold Medal for the best English Essay on the reciprocal advantages of a perpetual union between Great Britain and her American Colonies, notice is hereby given by order of the Trustees, that the said Medal will be disposed of at the ensuing Commencement, in May, for the best Essay that shall be produced on the subject proposed, by anyone of those who have received any degree or part of their education in this College; and, as the said subject is one of the most important which can at this time employ the pen of the patriot or scholar, and is thus left open to all those who have had any connection with this College, either as students or graduates, it is hoped for the honor of the Seminary, as well as their own, they will nobly exert themselves on a subject so truly animating, which may be treated in a manner alike interesting to good men, both here and in the Mother Country."

[From Boyle: Opera
Omnia. Venetiis, 1697]

RENÉ THÉOPHILE HYACINTHE LAËNNEC*

By GERALD B. WEBB, M.D.

COLORADO SPRINGS, COL.

> When the high heart we magnify,
> And the sure vision celebrate,
> And worship greatness passing by,
> Ourselves are great.
>
> DRINKWATER

FOREWORD

SINCE the time of the Protestant Revolt and the Catholic reaction, probably no epoch of European history till our own has been so fraught with consequence as that from the year 1781 to 1826. The age of Luther was one of religious reformation and counter-reformation; the age of Napoleon was one of political revolution and reaction. One can sufficiently characterize the second by saying that it embraced Mirabeau and Metternich. A significant age is the creation of significant men; it is therefore not surprising that during that period some of the most illustrious of names were inscribed in the pages of history. In England, men listened to the sonorous periods of the greatest of political philosophers, Edmund Burke, or watched the greatest of war ministers, the younger Pitt, accomplish alone what Austria and Prussia and Italy had not been able to accomplish together. In France, one can recall the sequence of events by the mere mention of the names of Necker and Marie Antoinette, of Mirabeau and Sieyès, of Danton and Robespierre, of Dumouriez and Carnot and Bonaparte. On the sea the greatest of naval commanders won the most significant of naval encounters, Trafalgar. By land the victor of Jena and Austerlitz finally succumbed in the most celebrated of modern battles, to a captain only less great than he. In the New World there was created a new nation, the fruition of the diplomatic talent of Franklin, the speculative talent of Jefferson, the financial genius of Hamilton and the military genius of Washington.

But peace hath her victories no less renowned than those of war. The subject of this brochure won in an encounter less celebrated but perhaps more notable than Waterloo; he attacked a despotism more subtle but not less potent than that of Napoleon. In the sad irony of fate, he fell a victim of the foe he so ably combatted. Possibly when future times shall make a keener evaluation, some of the figures we esteem so tremendous will shrink to a meaner stature, and with the passage of the years the captains and the kings will fade to a deserved obscurity, while the true benefactors will continue to grow with the growth of knowledge of their achievements and appreciation of their accomplishments. Many illustrious men lived between the years 1781 and 1826. Who knows but that ultimately men shall adjudge that the most illustrious of all was the dry, meager, asthmatic and phthisic Breton whose life was compassed by that span, Dr. René Théophile Hyacinthe Laënnec.

W. F. C. NELSON.

LAËNNEC'S BIRTH AND FAMILY

It was Pasteur's injunction that we should reverence great men, and it is in such spirit that we commemorate this year [1926] the centenary of the death of Laënnec.

Our information concerning Théophile Laënnec is mainly derived from Rouxeau's authoritative study of his life and work. This biography is in two volumes: the first, published in 1912, deals with the subject up to the year 1806; the second volume, published in 1920, deals with events subsequent to that date. Rouxeau's work is based on the family letters and papers, to which he gained access some eighty years after the death of Laënnec. From his intimate knowledge of the subject he gives an authentic portrait, and he avows his desire to depict, not the Laënnec of tradition, intellectual and frigid, but the man revealed by his studies as forceful, enthusiastic and animated. In the sketch which follows, we shall be mainly dependent on Rouxeau's painstaking compilations.

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* An address on R. T. H. Laënnec delivered before The Denver Clinical and Pathological Society, February 9, 1926. Edited by W. F. C. Nelson, B.A., B.D.

The paternal grandfather of Théophile was Michel Laënnec, who, in 1764, attained the office of Mayor of Quimper. He was a man of powerful physique, a conscientious parent, a severe disciplinarian and a hard worker. He pretended to some cultural attainments and cultivated the arts of writing and oratory. He was twice married, the first time to the daughter of an ex-mayor. The children of this marriage were Théophile Marie, Guillaume François and Michel Jean Alexandre. Their mother was of the family of Guesdon of Anjou, a family of some consequence in Quimper, strongly connected, and boasting in its ancestry a minor poet who, in 1593, had published "Les Loisirs de Rodope." Another notable of the family was a great grand-uncle, Hyacinthe Morice, the historian of Brittany. Of these sons, Théophile Marie became the father of the famous physician, while his brother, Guillaume, who was a doctor of medicine and a graduate of Montpellier, later powerfully influenced his nephew's career. The father of Laënnec was a person of excellent physique and sound health, consequently of a winning and joyous nature. His profession was that of a lawyer, but his talents were those of a litterateur. In those circumstances he failed to be successful. His ability in writing a poem did not atone for his weakness in preparing a brief; the constant intrusion of his poetical creations into the business of the bar was not calculated to advance him in the law, nor was his poetry of an order to win him fame in literary circles. His law was not sound, his poetry was not sublime, his tastes were not practical. Hence he pursued an errant career, passing from one situation to another, securing his different places by the judicious flattery of the politically powerful, and in later days not scrupling to try to use even his distinguished sons for the same purpose.

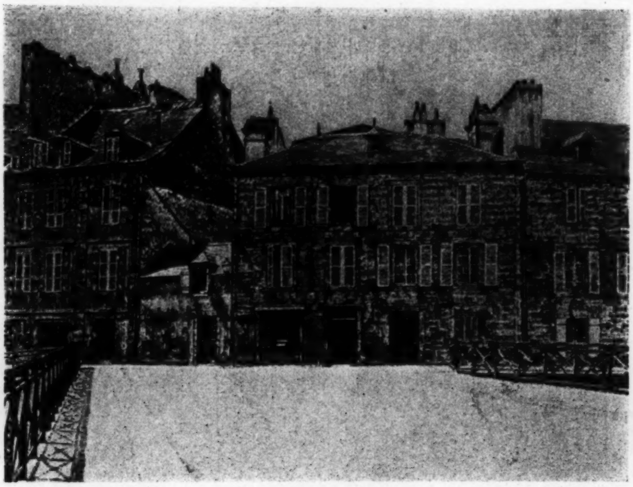
Théophile Marie Laënnec, Father of R. T. H. Laënnec, by an Unknown Artist.

Michelle Guesdon, the mother of Laënnec, was said to have been of feeble constitution. We know that as a child she had rickets, and it has been conjectured that she was tuberculous. Certainly her three brothers had died in their youth, and her two sons were possibly consumptive. It has been argued that a great man is always the child of a remarkable mother, but unfortunately we cannot judge the truth of the dictum in this case, for little is known of Michelle Laënnec; not a letter of hers now exists, and only one of her signatures. In connection with the speculation that the geniuses of the race are born of parents more advanced in years, it is interesting to note that the father and mother of Laënnec were respectively thirty-three and twenty-six years of age at the time of their marriage. Since they were cousins, a special dispensation was necessary to allow the union.

Quimper, where, at 2, rue de Quai, Laënnec was born, is located in Brittany at the junction of the rivers Steir and Odet. It is a charming country town with a beautiful cathedral, near which now stands the famous statue by LeQuesne erected in 1865 by the physicians of France to the memory of the town's most distinguished son. The Englishman or the American, on first beholding it, cannot but regret the contrast in his own country, where there is a distinct paucity of memorials to great physicians. Osler noted that there were more hospitals named after physicians in Paris alone than in all Great Britain and America, and while the memory of Laënnec, Bichat, Broussais and Bernard is thus preserved, the names of our great physicians sink into undeserved oblivion. Beautiful hills covered with woods and heather encircle the town of Quimper; the countryside, as I recall it, is most picturesque, adorned with hedges of broom and gorse which divide fields gay with cowslips, buttercups and daisies. The hedges are filled with blackberry bushes, the fruit of which is despised by the peasants. Bird life is conspicuous and varied, with magpies, cuckoos, nightingales, skylarks and finches. The country was not less attractive in the time of Laënnec, for in 1788 the English traveller, Arthur Young, describes the walks around Quimper as among the most beautiful in France.

In the picture shown, the last window to the left opens from the room where, on the seventeenth of February, 1781, René Théophile Hyacinthe Laënnec uttered, as the French would put it, his first infant cry. He was baptized the next day, and derived his names from his godfather, René Guesdon, and his godmother, Hyacinthe Guillemette.

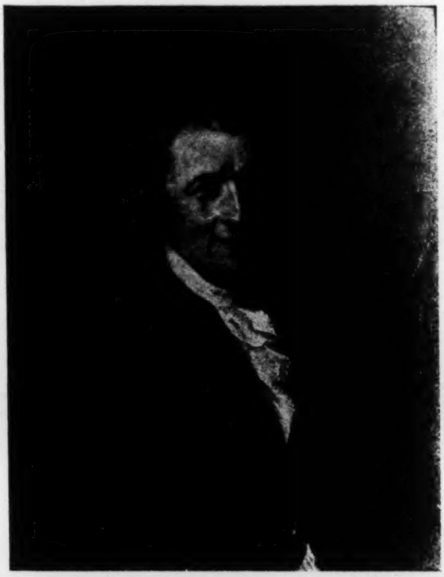
The origin of the name Laënnec is doubtful. It may be from "lenn," a reader, or from "laen," a pond or lake. Thayer, in one of his charming articles on Laënnec, tells us the name was originally written Laennec but pronounced Lennec. One of his biographers later placed a dieresis over the vowel, and thus made the name one of three syllables. None of the family so spelled or pronounced it, the collateral descendants still pronounce it in two syllables, though the French people generally use the incorrect pronunciation. Of the three names we shall use Théophile, its signification of Friend of God being most appropriate to the life he lived and the service he rendered.



2 RUE DE QUAI, QUIMPER. THE HOUSE IN WHICH LAENNEC WAS BORN. FROM ROUXEAU.

By a curious oversight the dates were omitted from the birth certificate, and seventeen years later Théophile had to obtain an official statement of his birth on the testimony of his father. Due either to the weakness of the mother or the custom of the country, a wet nurse was provided for the infant.

In 1753 the grandfather, Michel Laënnec, had purchased a small estate called Kerlouarnec in Ploare, near Douarnenez, and Théophile and his wet nurse may have been sent to this country house with its beautiful surroundings. Neither history nor tradition has preserved from the childhood of Laënnec any of those precocious utterances that delight the admirer of Macaulay, or any hints of that juvenile erudition that astonishes the student of Grotius. The other members of the family were Michel, who was born in 1782 and who was named for his grandfather who died about this time, and Marie, born in 1785. Another sister was born in 1786, but she only survived her baptism. Two days after her birth, when Théophile was six years old, the mother also died. The French have a proverb which runs: "A tuberculous mother may give birth to one child, rarely to two, and never to three children." If this proverb, which probably epitomizes generations of observation and experience, be true, the fact that Madame Laënnec gave birth to four children and practically died in child-bed would seem to negate the idea that she was tuberculous.



Guillaume-François Laënnec, the Famous Uncle Who Inspired Laënnec. Painted by Descarsins.

Boyhood and School Life

The two boys, Théophile and Michaud, were taken by their paternal uncle Michel, rector of a parish in Elliant, with whom they lived just one year. This clergyman later became one of the émigrés to England, where he finally succumbed to consumption. In 1788 the boys were sent to their other uncle, Guillaume, making the journey from Quimper to Nantes by sailing boat. This uncle, once a practitioner in Quimper, had later moved to Nantes after his marriage with a sixteen-year-old maiden from Rennes.

Guillaume Laënnec had graduated as a Doctor of Medicine at Montpellier, where graduation was easy for those who did not intend to practice in that vicinity, and had further studied under Hunter in England. But on his removal to Nantes, he discovered that the faculty had imposed restrictions on the practice of medicine, and that he must repeat his entire medical education under that faculty. When Guillaume had done this, and was on the point of being licensed to practice, it was found that he was married, and further technicalities had to be overcome. Finally a license to practice was procured from the parliament of Brittany. Even then, he was for long "held in quarantine" by his colleagues, but he needed only opportunity to prove his worth, and so signally did he serve when the last obstacles of legalism and provincialism had been surmounted, that he was elected rector of the univeristy of Nantes at the early age of forty. He had a good figure, though there was a tendency to embonpoint, was of a fresh complexion, had a long face, the mouth of a jester, and a slight inferior prognathism. His interest was not narrowly medical, he delighted in the humanities, really knew his Ovid, Vergil and Horace, and, like his father, was something of a writer and orator. His disposition was choleric but affectionate, "tête volcanique mais coeur chaud." His wife was of Amorique family; their one son, destined to become a famous lawyer, did not exhaust their capacity for affection, so they were delighted to receive into their home these two motherless children. The home itself had a commanding view of the Loire, and was unusually sunny. For three years the two boys were students at L'Institution Tardivel, where the ancient discipline prevailed, and it is some tribute either to the capacity for study or the skill in evading study of young Théophile that the punitive rod was not once applied to his palms or his pants. The one punishment recorded was that he was kept on a chair in his uncle's house while the other children were out playing, and the passage of twenty years did not serve to erase the bitterness of that memory. On the whole his life must have been pleasurable, and if we can believe that coming events may cast their shadow before, not the least pleasurable of his hours must have been those when he accompanied his uncle on his professional rounds, and submitted to a catechism on his academic progress.

In 1791 Laënnec was placed in the Collège d'Oratorie, where he was instructed in religion, political science, orthography, grammar, geography, Latin prose and verse, but not in Greek. A year later his progress is attested by two accessits to honor prizes, and a first prize in composition. The same year, year IV de la Liberté, the boy wrote a fable modelled on LaFontaine, entitled "La Barque et le Vaisseau," and translated the First Eclogue of Vergil into French verse. The poem is strongly bucolic in flavor and a natural observation is made in the realistic line: "Les vaches de Toinon s'arrêtent pour pisser." Further evidence of his interest in poetry is found in another poem he wrote as a boy of twelve, called "Fils du Laboureur." His good uncle, fearful that a baneful heredity was at work, and that the energies of the boy would be dissipated and his career marred by devotion to the Muses, was alarmed over his poetry, as at a later date, and with as little cause for apprehension, the parents of Pasteur lamented their son's devotion to pastels. Their holidays the brothers largely spent with an aunt Desirée at her home on the banks of the Erdre, enjoying the country pleasures of boating, fishing, hunting blackbirds and rabbits, and in riding a submissive jackass.

But while Théophile Laënnec was poring over his Eclogues or fishing the peaceful waters of the Erdre, tremendous events were in progress in his native land. With the calling of the States-General in September of 1789 began that sequence of events which we call the French Revolution, and with the emergence of Mirabeau commenced that procession of notables across the stage of French history, which, when Mirabeau himself, and Danton and Robespierre and Marat and Carnot had passed, was arrested by the arrival of one who came to stay, the Corsican lieutenant of artillery, Napoleon Bonaparte. No one who lived in France for the ten years that followed the calling of the States-General was unaffected by that cataclysm. Fiscal oppressions and legal anachronisms had resulted in penury and tyranny for the masses, and such penury and such tyranny as could not long be supported by a peasantry and a bourgeoisie that had even been patient under the caprice and the exactions of the fourteenth Louis. And so we have a revolt started by the middle classes which the middle classes could not control; we have three constitutions in three years where before was no constitution at all; we have the mad excesses of the Terrorists, a tripartite Civil War, with the Mountain against the Plain, and La Vendée against both, and we see a cabriolet driven through the streets of Paris on January twenty-first of 1793, from the Cricuit of the Temple to the Square of the Revolution, and we know that the son of sixty kings, now Citizen Louis Capet, is on his way to the guillotine. Such was France from 1789 to 1794.

The ferocity and ingenuity of the Parisian mob gave the capital an unenviable primacy in the sanguinary excesses of the Terror, but if Paris was first, at least Nantes was an untiring second. Farington notes in his Diary that half a million people perished in the Terror, and of these unfortunates, three thousand met their death at Nantes. The guillotine proved too slow an instrument for the zeal of the rabble, and tying naked men to naked women, they flung them into the Loire to expedite the slaughter. But even the "Noyade de Loire," though it proved faster than the guillotine, was yet too tardy a means, and they fell back on artillery and mowed down their victims with chain shot. Even then the Parisians were not satisfied with the efforts of their provincial comrades and Carrier, the villainous lieutenant of Robespierre, came to Nantes, and in the Laënnec home unfolded a plan worthy of a Caligula, to destroy half the population of Nantes. The forces of the natural order seemed to conspire with the wrath of man to that end, for typhus doomed many who had eluded the guillotine and the river, and some who escaped all three yet perished of hunger. Before he was fifteen years old Théophile had seen fifty heads fall into the basket under the guillotine outside the windows of his home, he had seen his uncle thrown into prison for six weeks on suspicion of not being in sympathy with the de facto government, and he had marched in the parade and carried a sabre on the occasion of the Fête de l'Être Suprême. He had undergone too his first act of apprenticeship in the art of Hippocrates, and while the uncle Guillaume was busy with the wrecks of war and typhus at the Hôtel Dieu, where he was physician-in-chief, the nephew was making lint bandages and dressings.

Despite the political confusion, the education of Laënnec went steadily on. His college was turned into a hospital, but in 1793 he entered a new school, the National Institute. One hundred and twenty boys continued in daily attendance through the war, the Terror and the typhus. The 14th Fructidor, *An* 2, at the distribution of prizes, Théophile captured the one in Latin; all the rest went to his brother Michaud. Théophile then entered for a course in physics at L'École Polytechnique, anticipating that he would later study engineering. His youth and the uncertainty of the times led his uncle to frown on this proposal. The winter of 1794–1795 was extremely cold, and in January the lack of fuel led to the closing of the National Institute. It is told of Laënnec at this time, when the pupils must *tutoyer* their teachers, that he was enjoying a welcome beam of sunlight at the school when it was intercepted by an instructor, whereat the lad exclaimed: "Ôte-toi de mon soleil."

The 26 Frimaire, *An* 3 (December 16, 1794), we have the first of a melancholy sequence of letters that have been published in which Théophile requests his improvident father to forward old clothes which his aunt would cut down for him to wear to school, and money to pay for books and the schooling itself. To the American it is an alien note that neither of the correspondents ever seemed to think that the boy might in some measure support himself by working, as he would do here in like circumstances. In the same letter he confided to his father his desire to become an engineer. Michaud, too, was casting about for a career, and his fervid love for the sea and his ambition for a marine life continued till they were dissolved by a trial trip that proved very rough.

The return letter from the father promised to defray all the expenses of the technical education which he was willing his son should pursue. But the good man wrote in the inflation of a new love, not for his son, but for the second wife he had lately taken to his bosom. The widow who had just cast her lot with the erratic lawyer was possessed of a comfortable income, and whether it was merely the ectasy of his love for her or the more substantial hope that he would now control her fortune that led him to promise so largely we cannot know; but we do know that his help was largely verbal, and that he seemed to consider the promise of support fulfilled when he had forwarded to his ambitious son some cast-off clothing. The permission to become an engineer came too late, for, under the promptings of an uncle whom humanity has much reason to thank, the young student had decided to study medicine.

Nor had his life lacked indications that such might eventually be his great interest. Neither the agitation of the times nor the impecuniosity of his father with its resultant bother had kept him from the enjoyment of life, and that enjoyment he found largely, even to the end, in physical exercise, in hunting and in walking in the country. Each phase of natural history interested him. He collected pebbles, insects, plants and birds' eggs. The instinct of a hunter was gratified by the finding of a duck gun in the woods, and his joy in its discovery was probably only equalled by his misery when he had to surrender it at the barrier on his way home. In his love for the natural world, in his curiosity over its flora and fauna, in his variety of collections, and in his keenness of observation, he was one with many of the master spirits of medicine. Even so had Jenner as a schoolboy collected fossils in the Oolite formation at Cirencester, and as a young physician won fame as a naturalist by his intensive study of the cuckoo. It was Jenner, too, who kept the great anatomist John Hunter supplied with natural history specimens. Koch, who was to discover the bacillus of tuberculosis, unconsciously prepared himself by his thorough studies in geology and botany. His botanical interests, and his collection of the wild flowers of Europe no doubt led Lister to his first careful observations on simple skin conditions like goose-skin, which were to develop the idea of bacterial infection of wounds, and so lead to antiseptic surgery. It is true that Pasteur was not directly a student of natural history. This is amusingly confirmed by the story of his visit to Fabre, where he displayed his ignorance of the silkworm and did not conceal his surprise that there was something in a cocoon which could be heard on shaking. But his pastel paintings, some of which are Holbeinesque, indicated that close observation of Nature that later enabled him to give such exact portrayals of his father and mother and many friends. There can be little doubt that his close scrutiny of his sitters was a stepping-stone which at a later time enabled him to pick out the right-handed and left-handed crystals of the tartrates, which resulted in his first great discovery in chemistry. This, in turn, led to his studies in fermentation which developed into his immortal work in bacteriology and immunization. So it was that in the year 1795, at the age of fourteen and a half years, equipped with a love of natural history,[1] fortified in his decision by the support of his uncle, and with a stock of old clothing which was of some use and the promises of his father to help which were of no use at all, Théophile Laënnec began the study of medicine.

(The Republican calendar had been established in 1793. The year began at the autumnal equinox, September 22. There were twelve months, each name of a month being significant of some climatic or agricultural feature. The twelve months were Vendémiaire, the month of vintages or grape-gathering, Brumaire, the fogs, Frimaire, the hoar-frost, Nivose, the snow, Pluvoise, the rains, Ventose, the winds, Germinal, seeding, Floreal, the flowers, Prairial, the fields, Messidor, the harvest, Thermidor, the hot month, Fructidor, fruitage. This nomenclature is incomparably more rational than our own, celebrating as ours does the forgotten names of Mars, Janus and Iulius, and further calling the ninth, tenth, eleventh and twelfth months the seventh, eighth, ninth and tenth months. This explanation is made that the reader may be able to identify the season of the year from the French names we shall from time to time use.)

THE STUDY OF MEDICINE

From 1795 to 1800 Laënnec studied medicine at Nantes. He commenced under excellent teachers. Darbefeuille was surgeon-in-chief at the Temple de l'Humanité, later known as the Hôtel Dieu. He taught physiology, pathology and therapeutics, all with an energy that made him a corps of professors in himself. He put everything before his students in picture form, as a botanist might. Bacqua, another teacher, was a distinguished surgeon. He had twice performed cesarian section on the same woman, saving the mother and children. Under these and other teachers, Laënnec began his studies in the autumn of 1795, at the age of fourteen years and seven months. The first five months were devoted to anatomy and dissection, the two following "à la médecine opératoire"; in the second semester, beginning April 20, he had physiology, pathology, and therapeutics for five months.

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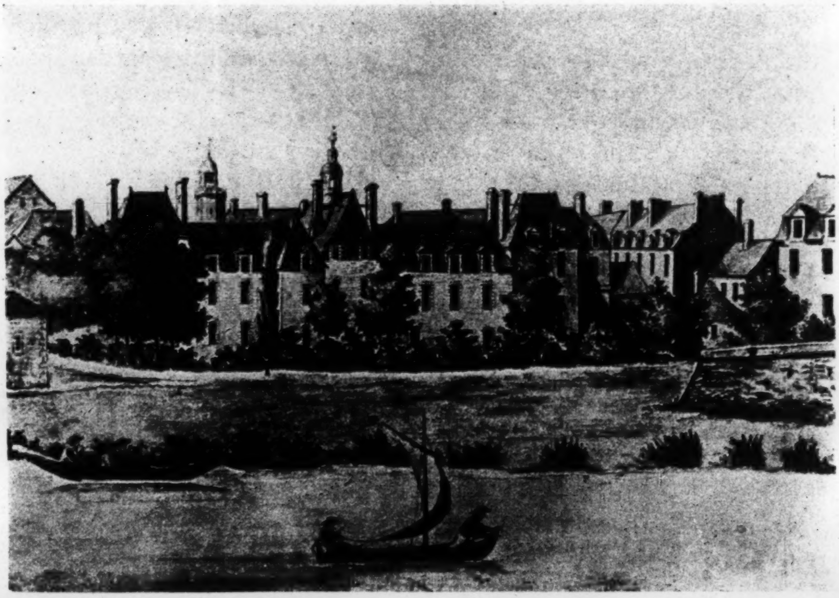
[1] J. J. Audubon as a lad of eight years was living in Nantes during the Terror, and collecting eggs, butterflies and insects along the Loire. It is well within the bounds of possibility that these Nature-loving boys were friends.



L'Ancien Hôtel-Dieu de Nantes. The Hospital in Which Laënnec Commenced His Medical Studies.

One can in some measure judge of the conditions in the hospitals then by the conditions there now. In my visits to the hospitals in Nantes and other places during the World War, I could not but note the comparative lack of cleanliness and the scarcity of plumbing. Awaiting orders at Blois in 1918, a major of cavalry made the penetrating criticism to me that the French people would be all right if they had fewer mirrors and more plumbing! However, Guillaume Laënnec was wiser than other children of his generation, he had reformed abuses and cleaned up the hospital, so that now each patient had a bed, and the curtains were not infected with vermin. The walls were whitewashed, and the mortuary, which had been in melancholy contiguity to the wards, indeed opening into one, had been removed to a desirable seclusion. The dissection room was under a ward. A judas, or peep-hole, allowed the water to run from one floor to the next. The Hôtel Dieu had 400 beds, and about 150 childbirths a year. Uncle Guillaume had charge of 100 fever beds, most of them occupied by sailors with tropical diseases. He was also head of La Paix Hôpital, and it is probable that Théophile did his first work there.

A fellow-student, Fizeau, five years his senior, was Laënnec's first friend. Even in his first year of study, Laënnec gave some indication of the thoroughness and originality that were to mark his career by drawing up a descriptive history of a patient in which he evinced good method and keen observation. He also continued his natural history studies, now stressing mineralogy. He ransacked the countryside for insects, plants and minerals, which he later arranged in order in his bedroom. The uncle writes to the father to voice his pride in the collection, and to voice, too, a little fear that his industrious nephew is spending a disproportionate amount of time in this way. Laënnec studied in the Botanical Gardens of Nantes which were near his home; Debuisson, a fellow-townsman, also possessed a natural history collection, the nucleus of a later museum, of which the boy availed himself. François Le Meignen, head of the Jardin des Apothecaires, whose children were the inseparable companions of Théophile, and who was himself, as the boy said, "his third father," also facilitated his endeavors in this direction. The boy raised rabbits with his friends, and found that they multiplied as in "Pigs is Pigs."

Another extramedical work was the study of Greek, which the uncle regretted he himself had not thoroughly learned. Under the urgings of his uncle, he enrolled at L'École Centrale. At this school Théophile also perfected his Latin so that in time he learned to speak it with a rare facility, and regretted it was not the international medical language of the world. All these things further endeared him to his uncle, and when in May, 1796, Guillaume lost a twenty-months-old child, "unconscious victim of Revolutionary conditions," he writes of his anguish to his brother, and voices his hope that God will spare Théophile to him, and that the achievements of the one may console him for the loss of the other. It was at such a time that the father with his infinite capacity for the unseasonable proposed that Théophile return to Quimper to attend a school newly opened there, but the uncle demurred, and the project lapsed.

The boy was now awakening to manhood, or to use the figure of Rouxeau: "La chrysalide devient papillon." He was more careful in his appearance, he desired better clothes, and wished to learn some of the lighter accomplishments, music and drawing, and to remove his awkwardness by a knowledge of dancing. These desires sprang partly from natural conditions, and partly from a wounded *amour-propre* that he should be deficient where his friends seemed to excel. All these needed money for their attainment, and it was a struggle to get it. The father was profuse in advice and niggardly with funds, indeed up to this time the boy had received from his doting parent exactly a double louis. But in some way obstacles were overcome, the lad learned to dance and developed a Pepysian passion for the flute. At one time he had determined to take service on a corsair to earn money, and this without consulting his uncle, but the plan faded out eventually. In the meantime Ulliac of Rennes had become his chief surgeon and the boy became devoted to him. Even at this time the uncle, while writing to the father of the boy's fine curiosity and zeal for new objects of study, fears that in his youthful enthusiasm he will overdo, and that his none too rugged physique will not stand the strain of sustained overexertion, a prophecy which events amply bore out.

About this time Théophile's stepmother invited him to Quimper for a visit, but omitted to defray his anticipated travelling expenses. The lady's motives were partially political, she was herself a royalist, her first husband had died an émigré, the political atmosphere which Théophile breathed was abhorrent to her, and she probably welcomed the opportunity to remove him for a time to what was to her a purer air. So Théophile prepared for his journey. The uncle wrote to his brother that the boy expected on his visit home to send reports on natural history observations and to collect specimens, but the cautious uncle, fearful for the boy's health, warned that he be not allowed to hunt and swim too much. The same letter carried high praise of the accomplishments of Théophile in Latin, literature, chemistry, natural history, anatomy, surgical dressings and minor operations. It also made clear that the boy was coming for a two months' visit only, and that it was not purely a pleasure trip, as the work planned would show. Medical studies must go on even in the holidays, for medicine is not like law: "Notre état est une chaine qu'il faut trailler á toute heure du jour et de la nuit."

The boy, meagerly provided with funds, waited eight days for a sailing boat and a favorable wind; neither came and, disheartened and rendered impatient by the delay, he set out on foot for Quimper, a distance of about thirty miles. Arriving home, he was disappointed to find his father away on business. But he visited his cousins, hunted partridges and wrote letters to his father to hasten his return. The interim was agitated by the attempts of the stepmother to induce Théophile to give up medicine, in which design the uncle interfered and implored the father to send Théophile back, for he had planned that the youth should succeed him in his practice. He also pointed out that the boy was not suited for business, he was not orderly, was careless of self-interest, and was easily deceived.

Finally, either to escape the arguments of his stepmother or because of the genuine love he bore his father, he set out for Saint Brieuc, thirty-five leagues away, on foot, to join his father. Rouxeau imagines the meeting, the simple joy of the boy and the emotional eruptions and histrionic gestures of the father. The main part of the business that had detained the provincial Blackstone was, as usual, literary rather than legal, for the good man was always more interested in epigram than in equity. A coffee-house keeper had changed the name of his place from Café de la Justice to Café du Commerce, and this was an opportunity for Théophile's father to make a neat epigram. "Why the change," he asks, "hasn't Justice for long been a Commerce?"

The visit came to an end finally, and Théophile returned to Nantes on foot, with a silver-headed cane in his hand and a gun on his shoulder. But on his return he was restless and could not work. Indeed he had enough to worry him. His trunk, on the return journey from Quimper, had been damaged and some of its contents ruined, a serious loss to a penniless boy. He had packed some natural history objects, and a red powder from some specimens he had collected in passing a mine had ruined his clothing. He had little left but the clothes he wore, and in writing his aunt for money to repair the loss, he says: "Si vous tardez, j'irai de mal en pis; vous m'avez trouvé républicain, je deviendrai sans-culotte." He also needed money so that he might take courses in chemistry and physics, which he lacked: "Each moment that I lose seems to me a century." The father rose to the occasion with a lengthy epistolary admonition to his son to clothe lightly, to affect a Spartan simplicity of life, to be frugal in habit, and to exercise, to swim, to hunt, to ride, to throw stones. He did not neglect to strike a Chesterfieldian note; the boy must learn cooking, dancing, singing, drawing, poetry, history and political economy. Then this later Polonius counselled his son to seek good company and avoid babble. Excellent as the advice was, and worthful as it must seem to posterity, it did not put stockings or shirts on a boy who lacked both.

In 1798 things improved somewhat. The father finally sent a small sum. In return, Théophile sent his father a picture he had done, saying that he was still as far from Raphael as was the subject from Napoleon. Two of his sketches have been discovered, one of a consumptive, following a description of Aretaeus, the other of a group of people which he had drawn to illustrate "La Guerre des Vénètes." The pictures are of historical rather than artistic interest. The money received enabled him to study Latin and Greek, art and dancing. Playing the flute, frequenting the theater, and writing love verses to one Nisa, were his avocations. But though the uncle disapproved this multiplicity of hobbies, his medical studies did not suffer by them.

In the spring of 1798, possibly due to over-fatigue on his long country walks, he developed a remittent bilious fever, which Thayer suggests was typhoid but it may have been an early tubercle attack. The fever was high, the respiration was embarrassed, there was great prostration, and a consultation was held. A laxative was given, eight stools resulted; there was nosebleed, stomach spasm and, for a time, pain in the side. However he made a complete recovery, and was taken to the country to convalesce. There, to his uncle's consternation, he devoted his energies to the flute. For a time he practiced for six hours a day, but, as Thayer remarks, no man with an upper lip like his could long keep away from it.

His passion for this instrument calls to mind another Celt, who was a famous flutist, a famous poet, a doctor, and at least an amateur in natural history. The parallel between the two, in profession, in love of music and poetry, in interest in natural history, and in racial strain, is rather striking. But Oliver Goldsmith made as little impression in medicine as did Théophile in poetry. His work on Natural History, though it is, as Dr. Johnson said it would be, "very readable," is notoriously inaccurate. His ability on the flute enabled him to travel through Europe without funds and yet support himself, and his emotions are incorporated in one of the finest of poems, "The Traveller." Another great Celtic physician of Cornish origin was Osler, whose life was not dissimilar. Both as boys delighted in Nature studies and in learning. The Gaelic and the humanities fascinated them. As physicians both devoted their energies to pathological anatomy in the search for Truth. These two famous physicians made exact observations and were averse to speculation. To each medical history was of the greatest importance and with it they illuminated their excellent lectures and treatises. While Laënnec immortalized himself by his anatomical studies, especially in tuberculosis, and in clinical writings and the invention of the stethoscope, Osler led in the elimination of tuberculosis and early suggested the binaural instrument.

In the fall of 1798, with little zest for work, Laënnec returned to school, and on account of his illness in the spring, his uncle hesitated to urge him along. He was now seventeen years of age, and his uncle wrote his father begging him to prepare to send him to Paris to continue his education, and to make a provision of 1500 francs a year for that purpose.

In the spring of 1799 Civil War again broke out. The lad was sent to Petit-Fort for grain from the harvest, but was robbed by Chouans on his return. About this time he passed his examination for Officer of Health, a short course that allowed graduates to practice on the peasantry. He made another trip to Saint Brieuc to visit his father, and under his encouraging tutelage soon wrote a poem entitled "Ina." In this poetic ecstasy, he asks Love to embrace the air he breathes:

> Doux souvenirs! Ah! Fuyez de mon coeur!
> Par vous Amour, en ces lieux plein d'horreur,
> Embrase l'air que je respire . . .
> Je brûle! Je meurs! . . . O, délire!
> Je ne puis croire à mon malheur. . .
> Mon coeur rempli de ton image
> Sur ces gazons, sous ce feuillage.

Théophile stayed three months in Saint Brieuc, the while the angry and suspicious uncle, well knowing the inertia of the father and the ill-will of the stepmother, and fearing that even yet his purposes for Théophile would be frustrated, urged upon the parents the necessity of sending the boy to Paris and the provision of adequate support. The father finally agreed that Théophile should go to Paris, where he had been already enrolled, and promised him 900 francs per year. The youth immediately returned to Nantes with this cheerful intelligence, but his uncle, wiser in experience, would not let him go to Paris till the money was in hand. What was the bitter disappointment of both when the money was not forthcoming. For the fifth time poor Laënnec took the course at the Hôtel Dieu, repeating work he knew by heart, and robbed of the company of his associates who had gone on to the capital. He was now eighteen years of age, and was gaining excellent experience from his work with the wounded soldiers. He was destined to come into closer contact with war, however, for the Chouans attacked Nantes itself. Théophile was mustered into the National Guard, furnished with a rifle, and went out ready to revenge himself for the stolen wheat. Three weeks later the cannon of Nantes thundered "joyeusement," and the news rapidly spread that General Bonaparte was First Consul of France. That was November 9, 1799.

Théophile was commissioned and joined an ambulance corps, the uniform costing more than he received in pay. His unit went to Vannes, and each of the day's events was recorded by the young soldier in the evening, writing with his knees for a table, his left hand holding the inkstand, and his paper illuminated by the feeble light of a single candle. The war stimulated him to verse as well as to prose, and he produced an allegorical piece, "La Guerre des Venêtes," in which he incorporated his "Ina." He signed with the anagram Cenneal, manifestly his name reversed. He also developed a system of shorthand. It was rather elementary: dans became ds, ation was aon, beaucoup was bp, and so forth.

In 1800 the indefatigable uncle was still urging his careless brother to provide a Parisian training, and inciting him to resolution by the recital of the boy's virtues and zeal. Meanwhile Théophile could not collect his pay for his military service, the hospital paid little, and paid that little late. His heart was broken by hearing that his father had sent Michaud to Paris while he, the eldest son, was ignored. Hope deferred maketh the stoutest heart sick, but hope realized maketh the sickest person well. The gloom of the uncle and the bitterness of the youth vanished with the receipt of a letter from the father enclosing a credit of 600 francs, and the combined urgings and plaints of nephew and uncle had borne the first of long-delayed fruits. After such a wait, after so many disappointments, after procrastinations that would have tried more phlegmatic natures than that of the fiery young Breton, was the first of his desires realized. In his impetuosity he immediately set out in a carriage for Angers, leaving his devoted uncle in bed with some indisposition. Before he had rid himself of the febrile cold with which he started from Nantes, he was well on the way, walking from Angers to Paris. He left Nantes April 20, 1801, and in about ten days he had reached Paris. "L'oiseau avait pris sa volée." The winter of his discontent was now made glorious summer. It was a happy day for Théophile when he tramped wearily into the Latin Quarter in search of his brother.

Study in Paris

Théophile joined Michaud in his lodgings near the Luxembourg Gardens, and immediately took up work in L'École de Médecine, which is today occupied by the Faculty of Medicine. On 12 Floreal, *An* 9, he entered his name at the Charité, in the clinic of Corvisart, for the courses in medicine, hygiene, materia medica and pathology. The Parisian medical world was at that time dominated and divided by the two famous teachers, Corvisart at L'École Anatomo-Clinique, and Pinel at L'École Philosophique at the Salpêtrière. Laënnec threw in his lot with the former. Corvisart was the founder of French clinical medicine. He especially stressed bedside instruction and thorough training in autopsy work. His alertness and enthusiasm attracted, as his brusqueness and sarcasm repelled, Laënnec. Corvisart's assistant was then Bayle. He was seven years the senior of Laënnec, but the latter was greatly attracted to him. Their origins, educations and tastes were curiously similar, as were their destinies, for each won fame for his work in the study of tuberculosis, and both succumbed to the disease. Laënnec studied carefully and methodically; no class, no autopsy, escaped him, and he as assiduously collected the aphorisms of Corvisart, which he later published in thirty-five articles. Bichat was another favorite; his genius was already attested by numerous publications, and just then he was preparing, at great effort, a treatise on pathological anatomy. Laënnec was advanced rather beyond the general run of students. He knew English, possibly some German and Italian, Latin thoroughly and Greek fairly well. He took courses in anatomy, physiology, chemistry, pharmacy, hygiene, pathology, materia medica, botany, legal medicine and medical history. With all this he found time to enter L'École Centrale for Greek; his ambition was to read Hippocrates in the original. He also took a special course in anatomy under Dupuytren, who was three years his senior. His assiduity and genius did not long go undiscerned, his teachers saw in him another Bayle, and selected him for the Society of Medical Instruction, which represented the élite of the students.

In 1802 Bayle gave his graduation thesis, which Laënnec took down in shorthand, as he also did the *viva voce* examination. In March of the same year Laënnec noted in an autopsy of a heart disease case the ossification of the mitral valve, with dilatation of the ventricle. This constituted his first published work. The father of pathological anatomy, and, as such, the idol of Laënnec, and one of his formative teachers, Bichat, died that year. About this time Laënnec reviewed Benjamin Bell's treatise on venereal diseases. He found that clinicians had confounded peritonitis with enteritis. He noted peritonitis at autopsies, and following his study of six carefully worked up autopsies, he wrote an article on this disease which contained a warm tribute to Bichat. With his comments, this communication was a complete story of peritonitis. Every type known today was reviewed; he even described the *facies grippé*. At the age of twenty-one this treatise won for the student large and immediate fame.

Laënnec's two friends, Brute and Fizeau, carried off the two first prizes in 1802. At the same time Dupuytren announced that he would publish a treatise on pathological anatomy with Bayle and Laënnec as collaborators. It was to follow the work of Bichat, who had grouped lesions, not according to organs, as had Morgagni, but by systems; i.e. serous surfaces, bones, tubercles in lungs, and so forth. Laënnec had the notes of Bichat's lectures taken by Fizeau and Buisson. These he decided to publish himself. In the same year the *Journal de Médecine* contained a report by him on a case of suicide committed with a razor. He also wrote abstracts of his friends' theses on Physiological Phenomena and on Amenorrhea. Later in the year he described the arachnoid membrane which Bichat had never dissected but had supposed to carpet the interior of the ventricles. Here he was in error, and Laënnec too was misled by the autopsy in his zeal to uphold Bichat. He mistook the superficial layer of the nervous tissue for membrane. In February, 1803, Laënnec described accurately and indicated the use of the synovial capsule of the shoulder, which is known today as the subdeltoid bursa. His next anatomical discovery was that of the capsules which cover the viscera, such as the liver. He showed that the fibrous capsule of the liver, named Glisson's capsule, was a prolongation of the covering of the liver and was not muscular. He described a similar capsule for the spleen and the kidney, but found no trace of it on the heart or the intestines, and less defined on the lungs.

Théophile's financial progress did not match his academic. He was practically penniless in Paris, and it was necessary, as of yore, for Uncle Guillaume to intercede with the improvident father. Laënnec was present at the examinations of his brother Michaud and forecast, in a jubilant letter to his father, his brother's success. He was right, for Michaud carried off three first prizes, in literature, in Latin literature and in general grammar. He also received the first prize in *belles lettres* at a concourse of the three central schools of Paris. Laënnec also wrote his father with justifiable pride of the success of his publication on peritonitis and mentioned that one of his admirers had proposed his name for La Société d'Émulation. He appends the less welcome intelligence that he and Michaud are delinquent sixty francs on their restaurant bill. In general his letters to his father are long and entertaining. The prudent father thought that such brilliant students might well be the admiration of their teachers, and he suggested somewhat baldly that his sons solicit their teachers for employment for the father in Paris. To that embarrassing request Laënnec could only reply that though he worked every day with Corvisart, the latter hardly seemed to recognize him. The father was destined to languish yet longer in the obscurity of the provinces.

Théophile had arrived in Paris about the time that Napoleon conciliated one of the forces hitherto opposed to the Revolution by the celebrated Concordat, which reconciled France and Catholicism. He probably shared the popular enthusiasm that greeted this rapprochement. It is possible that his interest in religion is in part at least traceable to the influence of his uncle, the rector of Elliant, during the year the impressionable boy spent with him. Certainly religion had one important, if indirect effect on his life. The accident of politics took him from the home of a priest and put him in that of a doctor and, to quote Rouxeau: "La médecine doit peut-être à la constitution civile du clergé ses decouvertes immortelles." Interests that had been latent now became visible, and at a time in life when many students abandon religion, he embraced it. One remembers in this connection Kipling's question as to where the bad medical students go to and the fine physicians come from. Théophile's hero-worship of Bayle, who was a believer, was also an indubitable factor. Then, too, eighteen months in Paris without a holiday had weakened a physique none too strong, and the young medical student appears to have been suffering physically. Like Pascal, he may have turned at such a season to the consolations of religion. Certainly its acceptance augmented that spirit of tolerance and kindliness that had always distinguished his character, just as it had mollified the spitefulness and acerbity of Bayle. And it was not uninfluential in the construction of his ideals. One of the letters that told of Michaud's success confided his own ambition to become a professor in some medical school. His only ambition was to make his life useful, and he wrote that money, success and fame could, without that, yield no ultimate satisfaction. One of the classical quotations that stud his letters is "Gloria mundi peribit, veritas Domini manet in aeternum."

He had need of consolation other than the temporal, for the temporal was not often forthcoming, and we have witness both to his hard work and his pitiable poverty in a letter that was started February 28 and finished March 13, in which he begs for money, especially that he may buy books. Again the insensate father tried to get him to return to Nantes, and again the watchful uncle intervened.

The Government had decided to donate prizes for students at all the special schools of Paris, and this was hardly announced when the examinations began. Laënnec entered for all the tests at the medical school. In surgery he was asked to amputate an arm at the shoulder joint. Later Dubois was overheard telling Dupuytren that Laënnec's incision with the bistoury was charming; he also admired the cutting of the tendons and the opening of the capsule as he turned the arm, the bone coming out so easily. In one question he was asked how to treat and manage a case of aneurysm of the lower part of the axillary artery. He said it was best to amputate the arm in the shoulder articulation. He quoted his authorities and made the demonstration mentioned. On the announcement of the results of the examinations, it was found that Laënnec divided the first prize in medicine with his friend Billery (in spite of the alphabetical order of the names, Laënnec was put first) and had taken the first prize in surgery.

The prizes totalled 600 francs, but notwithstanding this prospective wealth, he had to beg money from his father to appear decently clothed for the presentations. Here, as with so many others of his calling, he demonstrated his ability at an early age, now leading his classes, as later he led his profession. The ceremony of the distribution of prizes was opened by Arnault, popularly known as the French Juvenal. The élite of France crowded the hall to hear the brilliant speech, and it was a great triumph for the young Breton, for he was only twenty-two, to be called first for the prize in medicine, and again first for the prize in surgery, in the face of this august assemblage. He described to his father the awards; in medicine, the Commentaries of Hippocrates, Baillou, Sydenham, and other books, all bound in red morocco and accompanied by medals; in surgery, five volumes of the Memoirs of the Academy of Surgery, and surgical instruments in a handsome leather case. The latter he reserved for emergency, as he did not expect to be a surgeon. The same letter includes one of the usual ineffectual requests for money that he may take a little holiday, and the classical quotations testify that he was keeping at his Latin and Greek.

Some tribute to the fear he aroused in any competitive event is made in the incident of the examinations at L'École Pratique. When it was known that he was a contestant, only one other student would enter his name, and Laënnec was asked to withdraw. Since his residence in Paris, he had suffered with what he termed asthma, to combat which he turned to bizarre remedies. One day, in an effort to continue at his studies, he sat at his desk with his body naked. Benjamin Franklin also knew the value of air baths and we learn in his biography that in London he would study in the mornings with his body quite nude. The examinations were followed by a period of nervous reactions and to help this neurasthenia he remained for several days absolutely idle, dreaming of the country which he was unable to visit.

In the spring of 1803, Dupuytren opened a course in pathological anatomy, the first given since Bichat's, and modelled on the latter's ideas. Laënnec no longer held those ideas, and had adopted another classification: (1) alteration of texture: wound, fracture; (2) lesions due to a living foreign body: worm, insect; (3) alteration of nutrition: aneurysm; (4) alterations of form and position: hernia. This classification followed in some measure that of Morgagni. In September of 1803, Dupuytren announced the publication of his treatise but no mention was made of Laënnec's name. The latter promptly decided to write another treatise himself on pathological anatomy, and to open a course of lectures. He probably believed, as had his illustrious predecessor Bordeu, who proved that glandular secretions were incorrectly named, being an elaboration of elements, in that motto of Seneca: "Doceo ut discam" (I teach that I may learn). He had the assistance of friends in his lectures, and one of them reported to Guillaume Laënnec that his nephew had expounded in masterly fashion for two hours, manifesting unusual ease and eloquence. These lectures Laënnec continued for several years, starting in November and concluding in March. The delighted uncle predicted that Théophile would be a professor of medicine in Paris within three years, and his father made the rather envious remark that Guillaume was a more ecstatic poet than himself or his son when young Théophile was the subject of his rhapsody. "It is Pygmalion in ecstasy before the work of his hands."

In the circumstances, the friendship between Dupuytren and his young rival naturally cooled, but there was as yet no animosity. In December, 1803, the former founded an anatomical society and included the latter in its membership. He was now writing regularly for the *Journal de Médecine*, reviewing works on meningitis, reporting on heart disease and pneumonia, analyzing

Bichat's ideas on pathological anatomy, and writing original articles on fasting and bone diseases. Laënnec's writings all show the imprint of genius, for it is said that Osler, almost a hundred years later, being asked for a good description of pneumonia, told a student to read Laënnec. He turned to his first love in reviewing a book on natural history. An original contribution on worms found in the human body, and on hydatids, though not always accurate in description, named all the types; the acephalocysts were first described by him.

All this work went forward in despite of financial distractions. The persistent uncle was now importuning the negligent father to send Théophile money to allow him to finish his courses, money for parchment on which to write his thesis, money for clothing, especially for linen. The uncle elaborately explained that Théophile used a great deal of linen, due to ill-health, and a propensity to acrimonious sweating.[2] The fond parent forwarded 300 francs, and announced that he did not want to be asked for any more, ending his letter with the enigmatic injunction, thrice-repeated, "Be a physician." At the same time that he refused to help his sons, he was anxious that the sons help him; he wanted to manipulate their successes to the end that he himself might obtain lucrative employment in Paris, and his machinations were constantly placing Théophile in ridiculous positions before his influential friends. In March of that year, robbers got into Théophile's room, and stole twelve shirts, half his flute and all of his money, thereby rendering his sartorial and financial position still more precarious. He completed his doctorate examinations in April. A work had appeared, perhaps influenced by Wolfe's "Prolegomena," which threw doubt on the existence of a personal Hippocrates, and held that the name was a generic term like Hercules or Pharaoh. This led Laënnec to select Hippocrates and his doctrines for the subject matter of his thesis. Since he had gained some mastery of Greek the quotation of Hippocrates had been a constant delight and resource. On the front page of his famous treatise appears that saying: "To be able to explore is in my opinion a chief part of an art." He also, no doubt, was familar with and approved Hippocrates' statement that "The search for truth is difficult and laborious; how urgent it is for physicians to know how others have striven for it, if they are wisely to prosecute their own search."

The father, whose negligence and indifference had done so much to prevent this consummation, now that it was reached, was fertile of suggestion as how best to improve this opportunity. He immediately suggested that the thesis be dedicated to some influential minister and to the whole Laënnec family. With a fine sense of the appropriate, the young graduate dedicated it to his uncle Guillaume, whose care and interest had made it all possible, and who had had to pay the graduation fee at the last moment. The title of the thesis is "Propositions on the Doctrine of Hippocrates in Regard to the Practice of Medicine." The doctrine of Hippocrates, he says, amounts in practice to seeing in disease chiefly the prognosis which can be deduced from symptoms common to all diseases, and in slurring diagnosis, which can only be deduced from the study of symptoms peculiar to each disease. He pointed out that the writings of Hippocrates on disease are somewhat inexact and confused, but appear to be based on pathological anatomy. He shared Hippocrates' views with regard to fevers. His thesis on Hippocrates was the precursor of a revolution in the classification of fevers. At that time the so-called *fièvres essentielles* were divided into six orders: *angiothénique* (inflammatory), *méningogastrique* (bilious), *adéno-méningée* (mucous), *adynamique* (putrid), *ataxique* (malignant) and *adéno-nerveuse* (pest), numerously subdivided. This classification was espoused by Pinel and Broussais, whereas Laënnec proposed a return to the classification of Hippocrates, intermittent and continued fevers. Théophile defined what symptomatic medication should be, and concluded that if the method of Hippocrates, careful and constant observation of the sick being its basis, were followed, one ought not to keep to the letter of his doctrine, and limit one's self to prognosis at the expense of diagnosis. He also pointed out the great superiority of the moderns to the ancients in the classification of disease. His credo at the end reads (translated from the Latin in which the thesis is written): "I profess free medicine, I am not with the ancient nor with the modern, but seek the truth in each, and test everything by repeated trial." When tidings of the successful thesis reached Guillaume, he was, to use Rouxeau's expression, "delirious with joy and pride." Such had been his own teachings, it was a triumph for the ancient doctrines, and Guillaume was especially glad that he had encouraged Théophile to study Greek, so that he had gained knowledge of the ancients at first-hand, instead of through the media of translations. The father, noting the success of the son, was seized with a noble desire to emulate it, and to the consternation of Laënnec he prepared two sycophantic addresses, one to Napoleon, one to a minister whose name we do not now know, hoping, in vain as it proved, that their presentation might result in his rapid elevation to political power. The only result was that he embarrassed his sons. Laënnec was now elected, with Bayle, to the Society of the Medical School, which had originated as the Royal Society of Medicine. Pope Pius VII was then in Paris, come thither at the command of Napoleon for the latter's coronation, and when with Bayle and other doctors, Laënnec was presented to His Holiness, it was said that the Pope, as he put his hand on one of the heads, remarked in jest: "Pius Medicus! Res miranda!"

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[2] The writer at one time saw a nightgown rotted away under both arms as the result of a night-sweat in a tuberculous girl.

At the end of the same year the differences between Dupuytren and Laënnec blazed out in an open quarrel. One was tactless, the other vain. Since they were both at the same task, war was inevitable. In an address before the Society of the Medical School, in which he read the first chapter of his proposed book on pathological anatomy, Laënnec credited Bichat with work that Dupuytren had assumed as his own, and charged that Dupuytren had also overlooked some of his (Laënnec's) work. This blunt statement drew a printed reply in which Dupuytren, "the greatest of surgeons but the least of men," furiously attacked Laënnec as an ingrate who had learned the little he knew at his feet, and had omitted to learn the lesson of scientific probity. Laënnec answered with dry courtesy and scientific precision in a subsequent issue of the *Journal*, and upheld his own work, pointing out that it had been published before that of Dupuytren. The latter returned to the fray with greater insolence and brutality than before. But his only revelation was of his own egregious vanity and his desire to crush any who opposed him, for he had not the least proof to bring against Laënnec. At this point the editors of the *Journal* refused to carry on the controversy. Dupuytren, his *amour-propre* badly damaged, pettishly gave up the publication of his treatise and the delivery of his lectures, but Laënnec went on with both. He continued his studies of intestinal worms, and reported with sketches a case of dilatation of the mitral valve. As yet he had no practice, hence no income except from his father, and Guillaume was again writing on his behalf pleading for money to support Théophile, who, he says, "is working like the devil." Laënnec's linguistic interests took a new turn about this time; he developed a passion for the Celtic dialect of his birthplace. He found a resemblance between Sanskrit and Celtic, the survival of the folklore of each interested him, and he found opportunity among the wounded natives of Brittany who lay in the hospitals in Paris, to study and converse in his native tongue.

In 1805 Laënnec took his first holiday since coming to Paris. He visited relatives near Soissons. Here the dry scientist relaxed, he enjoyed again the sports of his boyhood, hunting hares and partridges, enjoyed again his neglected music, made verses and composed tender proverbs. It was here and in this vulnerable mood that he first met a young widow two years his senior, Madame Argou. We cannot know what passages there were between them, we only know that she later became his housekeeper ("Honi soit qui mal y pense," said De Quincey in a similar situation) and finally his wife. The playful and irrepressible Laënnec whom we see at Soissons was quite other than the crabbed precisian who was known to the clinics of Paris. He wrote a play in prose and verse for six actors; with little warning he wrote a skit for the amusement of a dinner party on an anniversary occasion. Asked to sing, it would have startled the religionists and scientists who knew him, to hear him reply that he knew only drinking-songs. The hostess agreed that such were eminently suitable for that dinner, and Laënnec after a pinch of tobacco sang lusty tribute to the plants of Tobago and the inventor of the bottle. Wine and the weed, he sang, were created to obliviate the griefs of life; water, he says with Hippocrates, is the root of all evil. After four years of the restrictions of student life, he apparently let himself go. One evening a distinguished ecclesiastic was present, and he expressed the desire that Laënnec would compose a song to go with some superb music that had hitherto only an absurd libretto. It was to be in the nature of a patriotic hymn. In a few days the versatile visitor produced an ode in imitation of a psalm, the last verse of which was prophetic of universal brotherhood. The verses were entitled "Dixit Insipiens in Corde Suo." The last few lines read when translated:

> Great God attend Thy Church's plea,
> May in our time Thy will be done,
> Let hostile peoples fraternize
> And at Thine altar be made one!

PRACTICE AND FURTHER WORK

Laënnec returned to Paris at the end of September, his asthmatic distress much relieved by his holiday, and though he plunged into his work with redoubled zest, he was only able to earn 150 francs in the first year of practice. He abandoned his student quarters and moved to better chambers near the Medical School to try to augment practice. Poverty is shown by a renewed request to his father to advance him funds; he lacked shirts, and a watch. A note of sentiment appears when Théophile asks for a picture of his mother and a lock of her hair. Incessant industry is attested by numerous communications to the *Journal de Médecine*, including a review of an historical essay on the medicine of the Arabs, and by a presentation before the Society of the School of notes on taenia and melanotic tumors.

A literary review by Laënnec has been recently discovered by Mettling in *Le Journal de Médicine* of 1807. The review embraces poetical works on medical subjects, and with the extensive bibliography attached, reveals unusual scholarship. From Lucretius to the period of writing Laënnec discusses the medical poetry of many nations, and quotes from Jérôme Amalthée, the Italian, who wrote "Medicina metrica" in 1561, that one cannot be a good physician without being a poet. We have already noted that Laënnec, like Jenner and many famous physicians, possessed poetical gifts.

Laënnec was now twenty-five years old.

> He had made his mark as a teacher; he was a member of the first medical society of France. As an anatomist he had discovered the deltoid bursa, and the fibrous capsule of the liver. He was an excellent surgical operator, he was a remarkable clinician, he was famous for his observations and his aphorisms. He had discovered and described peritonitis and acephalocysts. He was the first to describe accurately melanotic tumors. He was the editor of a medical journal, and had written a work on pathological anatomy (which he had just now decided not to publish for the present). [Rouxeau.]

Théophile had made a remarkable start on a career that was to be still more remarkable.

In 1802, following Bayle, Laënnec, through his anatomical researches, began to direct the medical world to distinguish the tubercle. Little had been published on tuberculosis except the work in 1740 of William Stark in England. Stark had anticipated much of Laënnec's work, but was perhaps unknown to the latter. It is possible that the words "Strak a assez bien décrit," found in the manuscript of a lecture on "Les Tubercles" in 1803, may refer to Stark. Tubercles had been only vaguely noted up to that time, and only accurately in the lung. Celsus (A.D. 50) employed the word tubercle, and Morton in 1689 first described tubercles in the lungs. From 1803 to 1805, both Bayle and Laënnec pointed out the varieties of tubercles, and also the possibility of cure. Both noted the presence of tubercles in different organs. Laënnec, as a result of over two hundred autopsies, described tubercles in the peritoneum, liver, epididymis, pleura, suprarenals, kidneys and uterus. He also pointed out the frequent occurrence of tubercles in the lymph nodes. Bayle, with nine hundred autopsies to his credit, called attention to the presence of tubercles in the intestines, heart, spleen, prostate, brain, muscles, thyroid and stomach; Bayle also first employed the term "occult tuberculosis." By 1803 Laënnec was able to say that tubercles had been noted in every tissue except that of bone. Soon after, he discovered tubercles in a skull, in vertebrae and in ribs. It was in examining a tuberculous vertebra that he accidently inoculated his own finger with the tubercle bacillus.

In March, 1804, Laënnec delivered the famous lecture in which were set forth the ideas on tuberculosis that have served to immortalize his own name and that of Bayle. He held that phthisis, which had hitherto been confounded with some twenty other diseases, was simply tuberculosis of the lungs. From this time the term pulmonary tuberculosis replaced phthisis. He admitted the contagiousness of tuberculosis in warm countries, and recognized that the disease was directly inoculable. He agreed with Bayle in the recognition of the possibility of latent tubercles in the lungs, and in the cure of tuberculosis of the lungs and lymph nodes. He disagreed with Bayle's contention that the disease only hampered the efficiency of an organ; his own idea was that a special toxic malignancy was the cause of tuberculosis and produced its symptoms. With one exception, all his contributions to our knowledge of tuberculosis were implicit in this lecture. Later in life he was to add a single item of the mode of healing of cavities. It is to be remarked that he wrote the best account extant on sputa. Bayle had described the miliary tubercle as the starting-point of tuberculosis; with him phthisis was a specific general disease; hemorrhage was the result, not the cause, of pulmonary tuberculosis. Four hundred and thirty-two pages of the unpublished manuscripts on pathological anatomy have been found scattered over France; it is a matter of regret that the pages Laënnec wrote on tuberculosis are still missing. In the first lecture that he delivered, he touched on the history of medicine, stressed the value of autopsies, and expounded carefully the proper method of making them. One should begin at the head, then open the chest and lastly the abdomen. He described how the findings should be reported and the specimens saved. It was the eve of the decisive battle of Austerlitz; Napoleon called five classes of conscripts, Laënnec was providentially overlooked and escaped that carnage.

His cousin Christopher wrote home that Laënnec thoroughly deserved his high reputation, his heart was as warm as his talents were great; Halle predicted that Laënnec would be the first physician of Europe before he was forty.

A word should be said of his health at this time. Rouxeau in his second study concluded that Laënnec's mother was not tuberculous; Laënnec himself was of that opinion. The error originated with Lallour, who had made the statement on insufficient evidence. Others had repeated it without verification. Rouxeau describes Laënnec as being well built and of good physique, and is doubtful if he really was a delicate child. His extraordinary endurance was well known, and was the more remarkable in one who lived as he did, spending long hours indoors and careless of obtaining adequate nourishment. In 1803, he complained of being easily fatigued, he often could not hide his irritability. His feelings may be judged from the note he then wrote: "Health is a treasure recognized only after it has eluded us." On December 7, 1803, he injured his finger at an autopsy on a case of Pott's disease, accidentally cutting it with a saw, but the tubercle which developed eventually healed completely. It is said that he frequently pricked his fingers at autopsies, and in 1819, he thus received a slight infection following an autopsy on a case of empyema. Following a hemorrhage, the younger brother Michaud died of tuberculosis.

From 1805 to 1808, Laënnec was one of the editors of the *Journal de Médecine*, for which service he received a meager stipend. Reviews and notes indicate that he read everything connected with this work. Though open to new ideas, Laënnec could not endorse, and hence opposed, the nebulous theories of Brown and Broussais. He was a protagonist of vaccination, and when his sister was seized with smallpox, he scolded his father for having neglected this precaution. Laënnec endorsed and practiced the method of percussion which had been introduced by Auenbrugger and brought into common usage by Corvisart, who was physician to Napoleon. This recalls the story of the physician and the Emperor. It has been related that Napoleon, when a victim of bronchitis, summoned Corvisart, hearing he was an up-to-date physician who employed the new art of percussion. The two became excellent friends and Corvisart had the courage to warn the Emperor that having climbed to such heights he must anticipate a proportionate fall. Napoleon is said to have replied: "Corvisart you are only a peasant." One vagary which Laënnec delighted to ridicule was that of Gall. By the dissection of many brains, and by the examination of the skulls of over two hundred people whose mental *differentiae* he knew, he was able entirely to demolish the pseudo-science of phrenology, while his zeal for the study of the history of medicine enabled him to show that the movement was reactionary, going back to similar ideas held by the Arab physicians. The logic and balance of his medical reviews indicate an unusual mind. Laënnec did not despise rhetoric, always noting with appreciation the vocabulary and style of contributions. He himself wrote simply, clearly and truthfully, never indulging in personalities. He closed his editorial career by reviewing Corvisart's work on Auenbrugger. That year, 1808, he also contributed to a Dictionary of Medical Sciences.

A consultation on an eminent Italian, the victim of angina pectoris, is still extant. Made in 1810, it consists of thirty pages of Latin, containing a careful history of the case, an analysis of the symptoms, his own ideas on the disease, the method of treatment and his desire to be of every assistance. I have recently seen in the remarkable Laënnec library of Dr. Henry Barton Jacobs of Baltimore an original consultation of Laënnec, on a case of stricture of the esophagus. Angina pectoris especially interested Laënnec, having himself suffered an attack. His lengthy writings on the subject advocate dry rubs for treatment. Only fragments of these writings remain, and in these are to be found analyses of the ideas of Heberden, Pinel and Jenner. The last believed the disease to be due to a lesion of the coronary artery. We remember that he was the first to recognize the beginning of angina pectoris in his friend Hunter, the anatomist. But Laënnec demonstrated that lesions of the coronary artery are rarely found in autopsies of patients dying of that disease, and he was inclined to attribute the malady to a cardiac neuralgia.

The father thought that by this time his son's eminence in the medical world ought to be recognized by a court appointment. Laënnec was not anxious for such distinction, feeling it would militate against his work. The only position which he would have considered was that of first physician to the Emperor or his consort, a position which could later have been had for the asking. His desire was to fill a chair at the Medical School entitled "The Doctrine of Hippocrates and of Rare Cases." The chair, however, was abandoned and the ambition frustrated. For five or six years Laënnec was attached to a dispensary, all the while working with his accustomed energy. In 1814 occurred the first downfall of Napoleon, and the nation that had for ten years dominated Europe was overrun by the Allies. Typhus accompanied defeat and ravaged the land. Of a hospital personnel of 746 physicians, students and pharmacists, a large number developed typhoid fever, and of that number 214 succumbed. A fine devotion to the province of this youth is attested by the special care he took of the Finisterre and Breton casualties of the war. He gathered them all in one hospital, collected native physicians who, like himself, knew the dialect, to minister to them, so that the wounded heard from their companions and their attendants the beloved accents of their own tongue. The Bishop of Quimper wrote a touching tribute to his work, and Laënnec's reply reveals something of the crowding of the hospitals and the deplorable lack of food, drugs and linen.

Could one have seen this Breton doctor moving among the patients, he would probably not have been greatly impressed by the physical appearance of the man. Laënnec was of small stature, only five feet three inches tall, and built in proportion. In fact if there were any disproportion it was that the physician was too high for his frame, for an eye-witness tells us he was thin as a shadow. Such an appearance would have been a distinct handicap to a lesser spirit. The complexion was blemished, the eyes were sunken, the weasel-face was emaciated. But the manner was surprisingly energetic for so poor a physique, and though Laënnec's demeanor was simple and modest, he radiated a consciousness of power that inspired in his patients the utmost confidence. Though, as we have seen, he was a man of considerable enthusiasm and, at times, gaiety, he outwardly manifested a cold, meditative, even preoccupied countenance that did not invite intimacy. In the pursuit of the practice of medicine he was completely self-sacrificing; devoting himself to his patients, he surrounded them with countless attentions, and the fee was always a last thought. It is said that he stayed with one suffering patient forty nights, and was up and down each night.

Laënnec was always more anxious to give relief than to make a diagnosis, and his success attests his efficiency. In time he gathered a distinguished clientele. Alexandre Dubois paid a medical fee by painting a portrait of his physician. Madame Chateaubriand persuaded her husband to consult Laënnec, whom she called her little "Secco." It was feared that Chateaubriand had an aneurysm, but after Laënnec had made a careful examination he pronounced that there was no disease. The fearful patient, not altogether satisfied, asked if he might apply leeches, and Laënnec dryly told him to do so if he gained any amusement thereby. In the year 1811, the young physician was earning 8000 francs in practice. He kept morning hours for the patients who came to his house, in the afternoons he hired a cabriolet and drove to the four quarters of Paris.

As soon as he was able, the son commenced to send his father money, first 600 francs, later 1200 francs. The latter was in financial difficulties, legal squabbles were precipitated in the family, but happily Michaud, before his death in 1810, forgave the father. The grandfather's estate at Kerlouarnec had descended to Théophile senior, and he almost lost it through mismanagement, but the son by dint of considerable financial sacrifice managed to liquidate the debt and keep the property in the possession of the family. The estate was small, consisting of two farms and a chapel, Sainte Croix. Laënnec now naturally became interested in farming and country life; music was superseded by agriculture, landscape gardening was studied in a small way, and like others whose lives have been mostly urban he at last came to the conclusion that farming was man's true vocation. Possibly his health drove him to that position. He was relatively free from asthma, but was troubled by insomnia and digestive disturbances, and believed himself a hypochondriac. In 1808 he had an attack of cholera morbus.

By the year 1814 Théophile was badly in need of a vacation, and went to Kerlouarnec in the certainty that the country life would recreate. An attack of gout had once cleared up when he got in the country at Soissons with a gun over his shoulder. For one of such a frail appearance he was able to walk long distances, but exercise was impossible in Paris. Théophile had three happy months on his estate, busying himself with the cares of a landlord, and perfecting his dialect so that he was able to write the tenants in Celtic about fertilizers and ditches and the rotation of crops.

But a year later the asthma returned and was followed by a second attack of angina pectoris. Laënnec wrote an account of his experience in Latin, giving an exact description of the pain in the left chest and arm, and of a digestive disturbance which accompanied it. He noted that his heart continued to beat quietly. After two hours relief came and there were no after effects. Still later Laënnec suffered constant tenacious headaches with paroxysms, the sensations were as though his head was in a vice. He also complained frequently of attacks of dizziness.

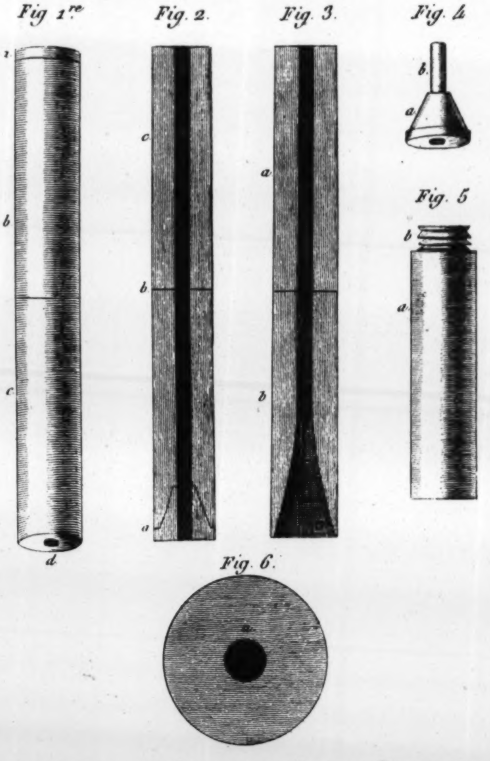
Phthisis had robbed him of his brilliant brother in 1810; in 1816 the same disease removed his close friend, Bayle. Each physician had early manifested interest in natural history, Bayle as a lad had given names to some species of insects. He naturally inclined to the study of medicine, and after a two-year course which made him an Officier de Santé, Bayle came to Paris in 1798, and studied under Corvisart. He inspired Laënnec to realize the value of autopsies each, as we have noted, performing a vast number. Bayle became a Doctor of Medicine in 1802, and his thesis on a new form of gangrene created a sensation. He aptly defended himself when his statements were challenged and was as eager to disown false theories as to get at the true. Replying to a question as to whether some kinds of humors gave rise to a variety of white inflammation, Bayle said: "Of what use are all these hypothetical deductions, why resort to a pure operation of the imagination in explaining a natural phenomenon? Is it not better to simply say 'I do not know,' than to erect a pompous edifice on the foundation of moving sand?" In 1804 he developed insomnia and oppression in the chest, and in 1816 died of tuberculosis, at the age of forty-two.

The promotion of Dupont and the deaths of Mongenot and Bayle created hospital vacancies, and Laënnec was offered the appointment at the Necker, which at that time was rather despised. He accepted, partly because the hospital had a fine garden that offered the means of exercise. There he took up his work, starting with a service of twenty beds.

THE STETHOSCOPE

Before Laënnec's time, chest diseases had never been carefully studied, although palpation and percussion had been introduced. Hippocrates had studied pleural fluctuation and had even attempted to interpret noises heard in the chest. Bayle had made a similar attempt to study the heart sounds. Double had also listened to the heart and lungs. In the seventeenth century Robert Hooke, in England, had listened to the heart and had described wheezing in the lungs. The custom had been to apply the ear directly to the heart or chest, and Laënnec objected to this procedure because of modesty and the lousiness of many patients. Blood would rush to his head and cause a confusion of sounds. The obesity of a girl patient at the Necker Hospital, suffering with a heart condition, made immediate auscultation useless, for only faint and distant heart sounds could be noted. In walking through the Gardens of the Louvre about this time Laënnec came upon a pile of litter which had collected as a result of the political chaos and the attendant neglect. Here a joyous crowd of urchins played. Their amusement was to divide into two groups, one at each end of a wooden beam, and while one group scratched and tapped at one end, the second group, their ears pressed to the other end, listened in childish amazement to the sounds. Laënnec looked and understood. He set out for the Necker at a fast gait. Reaching the room of his adipose patient, he seized a paper-covered book, rolled it into a tight cylinder, and to the amazement of the onlookers, he placed one end of this crude instrument against the patient's heart while he applied his ear to the other end. He could hear the heart sounds and also the respiratory murmur. Emotions usually carefully suppressed were stirred, for the possibilities of the discovery were instantly seen. To improve the instrument Laënnec wished to eliminate the central canal. Fortunately this was not immediately possible, otherwise he might not have discovered the phenomenon of pectoriloquy.

Notes on the records of the Necker Hospital now appeared indicating the use and results of the *cornet de papier*. At this time Beaugendre was his faithful assistant. It was he who later reported an autopsy on a woman pregnant fifty years before, finding in the uterus a completely petrified fetus. As patients, Laënnec auscultated Madame Argou for angina pectoris, and the famous Madame de Staël, who had developed dropsy. Laënnec claimed he discovered fluid in the chest of the latter by means of his instrument. At the autopsy, however, no fluid was found, but there had been time for absorption. Toward the end of the year 1817, Double published a work in which he advocated placing the ear against the chest for examination. Later, in 1834, he claimed the paternity of auscultation before the Academy of Medicine. Laënnec also published some notes on his new method in 1817, and set himself to prepare as quickly as possible the results of his researches. He had already studied empyema and had noted what he termed egophony in pleurisy. In a tuberculous patient he had detected the Hippocratic sign of hydrothorax and named it succusion or commotion. A new phenomenon, pectoriloquy, was noted in another tuberculous patient at the Necker Hospital. Her bedside was besieged for demonstrations, but the cavity disappeared



ILLUSTRATIONS OF PORTIONS OF ORIGINAL STETHOSCOPE, FIGURE 6 BEING THE ACTUAL DIAMETER OF THE CYLINDER. FROM "DE L'AUSCULTATION MÉDIATE," 1819.

and the patient lost her fame.

Laënnec wearied of rolling up paper cylinders and tying them with strings, so he learned to turn on a lathe, and then made solid batons each about a foot long. He could hear the heart sounds better with these, but he could not hear pectoriloquy, which with the solid cylinder sounded only as a vague bronchophony. By experimentation he found that a central canal in his baton overcame this difficulty. Therefore two cylinders were necessary for an examination. Heavy woods, like ebony, and the lighter woods, like cedar and cane, were fashioned. He even devised cylinders made of goldbeaters skin inflated with air. In the end Laënnec found that a light wood, preferably beech or linden, was most satisfactory. The acoustic arsenal, as Rouxeau puts it, consisted of three batons, the last of which had the central canal enlarged at the chest end. This enabled him to hear the respiratory murmur, and the "râle." This new name he created and introduced. Laënnec gave to his method the name *auscultation*, from *auscultare*, a word coined by Foës to distinguish the Hippocratic method of examination; he prefixed the adjective *médiate* to indicate the use of the stethoscope.

His was the usual lot of the creative genius. From the competent Laënnec met with indifference, from the incompetent with ridicule. In February, 1818, he presented before the Academy of Sciences a paper entitled, "A Memoir of Auscultation," which later became the first part of his memorable treatise. Dr. Cowan says that "this epoch-making memoir was listened to with respect, but without the slightest trace of enthusiasm." From the lesser spirits of his profession he could not expect enthusiasm nor escape ridicule. A charming picture of Laënnec and an indication of the general attitude toward his discovery is found in Kipling's story of the "Marlake Witches." Oliver Wendell Holmes in his "Stethoscope Song" wrote amusingly of the "listening tube" for "sounding the chest":

There was a young man in Boston town,
He bought him a Stethoscope nice and new,
All mounted and finished and polished down,
With an ivory cap and a stopper too.

It happened a spider within did crawl,
And spin him a web of ample size,
Wherein there chanced one day to fall
A couple of very imprudent flies. . . .

The doctors being very sore,
A stethoscope they did devise
That had a rammer to clear the bore,
With a knob at the end to kill the flies.

Now use your ears, all you who can,
But don't forget to mind your eyes,
Or you may be cheated, like this young man,
By a couple of silly, abnormal flies.

The publication of Laënnec's book was delayed by his suffering an attack of gout in the knee, which terminated suddenly. Rouxeau describes what he calls polymorphous nervous affections which include headaches and vertigo. The famous patient, Madame de Chateaubriand, now developed a cough, fever and pulmonary hemorrhage, but since Laënnec could not detect pectoriloquy he doubted the presence of phthisis. Consultants diagnosed the condition as tuberculous, and gave the patient but few months to live; she recovered and lived to enhance the reputation of her physician.

In August of 1818 Théophile took another holiday in Quimper, journeying thither in his own cabriolet. He spent a few months there, bought two more farms, and after an enjoyable time in the out-of-doors and a visit to his uncle Guillaume in Nantes, returned to Paris prepared to publish the book, which he had previously completed. Laënnec received a warm welcome at the Necker, for he was now the most considerable physician in Paris. His practice multiplied and his interests did not diminish. He auscultated animals and endeavored to make his instrument of use to the deaf. He vastly improved it by the conception of a cylinder which was funnel-shaped at the chest end and divided into two pieces for convenience in carrying. He also helped a friend with the plates which were to be published in his book. With his lathe he himself made many batons of walnut which were sold with copies of his treatise.

The instrument went under many names. He called it a cylinder himself, others called it a baton, a solometer, a pectoriloquy, or a *cornet medicale.* Uncle Guillaume suggested the name thoraciscope, but Théophile was too much of a purist to accept a name that combined Latin and Greek, so he changed the name to stethoscope. I was recently present at a meeting of physicians wheren one knew either the origin or meaning of the word. Though he coined this name Laënnec never employed it, preferring to style his invention a baton or cylinder.

"DE L'AUSCULTATION MÉDIATE"

In August, 1819, appeared his monumental work. It is entitled "De l'Auscultation Médiate, ou Traité du Diagnostic des Maladies des Poumons et du Coeur, fondé principalement sur ce nouveau moyen d'Exploration." Thirty-five hundred copies made up the first two editions. It was issued in two volumes, selling for thirteen francs; the stethoscope sold for threefrancs. I have studied this work and much of it has been translated in the excellent little book on Laënnec by Hale-White.

The chapter on investigation of the voice tells of the discovery of the sign of pectoriloquy. Laënnec writes:

> The subject who presented it was a young woman about twenty-eight years of age, laboring under a slight bilious fever, and with a recent cough which had simply the characters of that of pulmonary catarrh. While holding the stethoscope applied below the middle of the right clavicle I made the patient speak. Her voice seemed to issue directly from the chest and pass unaltered through the central canal of the instrument. This phenomenon occurred over an area not larger than a square inch. In no other part of the chest could I find anything like it. Not knowing to what to attribute it I examined most of the patients in the hospital with reference to this point and found the same sign in twenty of them. Almost all of them were sufferers from phthisis who had reached an advanced stage of the disease. From that time I began to suspect that the phenomenon might be due to anfractuous (full of windings and turnings) cavities produced by the softening of tubercles and known under the name of ulcers of the lungs. The most of the patients who showed this sign having later died in the hospital, I was able to verify by autopsy that I had reasoned correctly.

Fig. 3.

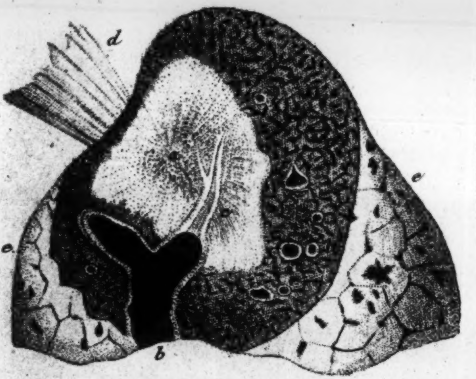
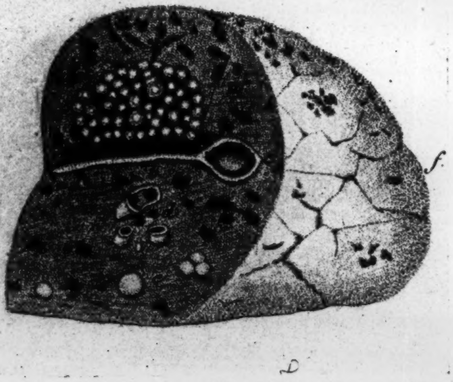


Fig. 4.



TWO ILLUSTRATIONS FROM "DE L'AUSCULTATION MÉDIATE," 1819. FIGURE 3 SHOWS FIBROUS CARTILAGINOUS SCAR IN HEALTHY CARBON-LADEN LUNG; WITH BRONCHIECTASIS. FIGURE 4, A GROUP OF GREY TUBERCLES, YELLOW AND OPAQUE AT CENTER. INCOMPLETE CICATRIZATION OF A TUBERCULOUS CAVITY.

It is interesting to read Laënnec's statement that tuberculous patients formed one third of the whole number then treated in the hospitals of Paris. The pathological studies reported on tuberculosis are most complete, and it is noted that in sufferers from phthisis rarely the lungs alone contain tubercles; almost invariably they are also present in the walls of the intestines where they provoke ulcers which are the cause of the profuse diarrhea.

The studies of the breath sounds and râles are substantially the same as we know them today. Laënnec attributed bronchiectasis to the effects of any malady which would cause coughing in a prolonged and violent way over a considerable period of time, especially a disease like whooping-cough. He claimed that patients with bronchiectasis might live to a great age. The chapter on pneumonia is, as we have related, still a classic for medical students. Percussion is discussed and the errors it might lead to through ignorance of the normal chest are indicated. Even the different tones resulting in rachitic subjects are dealt with. In the chapter on pleurisy there is no reference, in any edition, to the pleuritic rub. Laënnec noticed that the respiratory sounds were fainter as a result of pleurisy, but stated that no râles were present unless at the same time there happened to be pulmonary catarrh, which was unusual. He indicated the resultant shrinkage of the chest from pleurisy, and wrote excellent pathological studies on that disease. He described with accuracy emphysema, metallic tinkling, pulmonary apoplexy, edema, and gangrene of the lung. There is an excellent chapter on pneumothorax, and also on the examination of the râle. He divided râles into (1) moist râle, or crepitant; (2) mucous râle, or gurgling; (3) dry sonorous râle, or snoring; (4) dry sibilant, or whistling râle. The chapters on heart disease are not so illuminating, owing to the fact that the physiological explanation of the heart sounds was then unknown. "Starting with the false hypothesis that the second sound was auricular in origin, he never found his way out of the jungle" (Thayer).

On January 24, 1819, Laënnec infected his finger while performing an autopsy on a case of empyema. Fortunately the infection did not become serious. In July of that year he suffered an attack of gout, the asthmatic trouble returned, and he began to suspect that he might be tuberculous. A few days in the country rid him of the attack of asthma which had lasted several months, and this experience led to retirement from practice and his return to Brittany. The uncle was very solicitous for his health, but was inclined to be sceptical of the efficacy of a marine climate. Forbes, who translated Laënnec's work into English, received at this time a communication from Théophile's cousin, Dr. Mériadec Laënnec, stating that the illness had none of the characteristics of tuberculosis, that although puerile respiration could be heard, there was no evidence of disease in the chest, nor was there any cough. The patient's spirits were depressed, he suffered from dyspnea and had frequent fainting attacks. Laënnec himself described his condition as *taedium vitae*, or, as we should say today, a nervous breakdown. In preparation for retirement, Laënnec gave some of his books to the hospitals, sold many of the rest and disposed of all his household goods. Madame Chateaubriand wrote to one of her friends that her little "Secco" had left for Quimper without even bidding his patients adieu. It is amusing to read her resolution that in his absence she will have no other physician, but will use her own good sense and diet on asses' milk.

Meantime the treatise on auscultation was meeting with a very cool reception. The physicians who used the stethoscope were commonly considered to be mere charlatans. The now-celebrated book was then harshly criticized because of the absence of a third volume which would have discussed the matter of treatment. What was the use, said the scoffers, of such skill in diagnosis if there were no remedy to administer? The accurate description of bronchiectasis and the belief in the curability of tuberculosis met alike only satirical ridicule. It is a fact that the author of this epochal work received from his friends of the medical world only two letters in praise of his researches. The illustrious Chateaubriand, in writing a historical review of the year, praised Laënnec, but the general attitude is more accurately revealed in Forbes' preface to the translation of the treatise. Speaking of auscultation, he wrote:

> That it will ever come into general use notwithstanding its value, I am extremely doubtful; because its beneficial application requires much time and gives a good deal of trouble both to the patient and the practitioner; because its whole hue and character are foreign, and opposed to all our habits and associations. It must be confessed that there is something even ludicrous in the picture of a grave physician proudly listening through a long tube applied to the patient's thorax, as if the disease were a living being that could communicate its condition to the sense without. Besides, there is in this method a sort of bold claim and pretension to certainty and precision in diagnosis, which cannot at first sight but be somewhat startling to a mind deeply versed in the knowledge and uncertainties of our art, and to the calm and cautious habits of philosophizing to which the English physician is accustomed.

More intrepid spirits than the cautious Forbes did not stop here however. Kergaradec and Louis introduced the stethoscope for use at the Charité. Even Laënnec's archenemy, Broussais, did not scorn this invention of his foe. Laënnec's cousin, Mériadec, wrote his thesis on auscultation, and made other investigations under the aegis and encouragement of Théophile. Laënnec's advice to Mériadec is interesting and pertinent: "Do not fear to repeat what has already been said. Men need these things dinned into their ears many times and from all sides. The first rumor makes them prick up their ears, the second registers and the third enters." Uncle Guillaume had found the stethoscope useful, but wrote to warn Théophile that he must expect to encounter antagonism similar to what met such men as Harvey, Sydenham and Jenner. In June, 1819, James Clark, a young Scotch physician who was visiting the hospitals of the Continent, came to the Necker. He had studied the climates of the various parts of Central Europe for the treatment of tuberculosis, and sat under Laënnec. In 1820 he published a book on observations which called attention to auscultation and its inventor. It was he who aroused the interest of Sir John Forbes, and the latter published a work on diseases of the chest and their diagnosis by acoustic instruments. Indeed the prophet was honored save in his own country. His work was well received in most of Europe, and in the New World the editor of the *New England Journal of Medicine and Surgery* planned to translate the treatise, but he was anticipated by Forbes.

Laënnec. Sketched and Lithographed by Himself, about 1820, at Kerlouarnec.

After visits to Saint-Brieuc, where his father was, and to Lannion, Théophile came in October to Kerlouarnec, where he spent two years' isolation alleviated by the company of *la veuve* Argou. He set to work to renovate the estate, which had become badly dilapidated. Avocations were riding horseback, walking in the woods with his dogs and trimming his trees. Again Théophile took up the study of Gaelic and became interested in tracing the affinities in the Celtic families, such as the Irish and Cornish. Dining with the Abbé Guezengar, he told him the origin of his name, "Tree of love." He investigated the causes of the disappearance of the sardines and the general decrease of the fishing industry in Brittany. The effect of marine climate on tuberculosis interested the scientific spirit and the report of the rarity of this disease on his own seacoast was confirmed. In the two years at Kerlouarnec Laënnec found only six victims and of these three recovered. He found time from the pursuits of a country gentleman to remodel his stethoscope; he replaced the screw with a pin, and adapted it so that either end might be placed at the ear.

A man from Quimper condemned with the diagnosis of pulmonary tuberculosis in its last stages, came to Laënnec for examination. The physician discovered an empyema and called in a surgeon to incise the chest. Two and a half pints of pus escaped. Deprived of professional income Laënnec soon found his finances in a bad way. He was compelled to reduce for a time the pension he allowed his father, and the thousand francs yearly that the government now voted him from its allowances to savants and men of letters was not sufficient. Health now much improved, Théophile was able to tramp eight hours in the snow without fatigue, but found it difficult to concentrate on reading or writing. His financial troubles were exigent, however, and return to work in Paris was necessary.

Return to Paris

Laënnec reached the capital on the fifteenth of November, 1821. His reception was enthusiastic. Physicians from all the countries of Europe crowded the Necker to hear the discoverer of auscultation. Patients were importunate for consultations. Without any solicitation he was appointed as physician to the Duchess of Berry. The position was no sinecure but it augmented his income by four thousand francs. The Duchess was delighted with her physician, she enjoyed his infinite variety of knowledge, and tried in every way not to allow the appointment to impede other professional work. Guillaume did not live to witness all the honors that came to the nephew for whose success he was so largely responsible. At the age of seventy-three death came from cancer of the stomach, and though Théophile hastened to Nantes he arrived after the end. In 1822 came the appointment of Professor and Royal Lecturer at the College of France, and full membership in the Academy of Medicine. In 1824 he was made a Knight of the Legion of Honor.

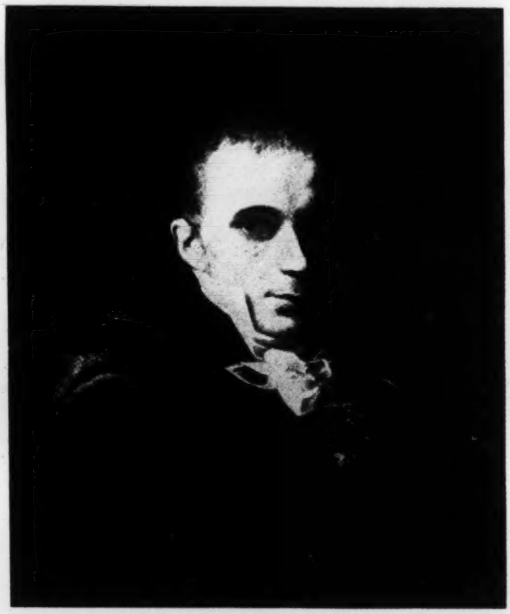
Meanwhile Laënnec had resigned his position at the Necker and had taken over a clinic at the Charité. Notes, which still exist in his own hand, cover the field of general medicine. As one of a commission to study animal magnetism, he argued that it was nothing but trickery. Laënnec used the stethoscope for the study of muscle sounds, and noted the bruit produced. He first used antimony in large doses as an emetic, finding it useful in patients who could not be bled, especially those with pneumonia. He also tried several specifics for tuberculosis. Inunctions of potassium iodide and emanations of chlorine gas gave no satisfactory results. Experience on the seacoast led him to advocate fresh air, and in his own last illness he insisted, contrary to the notions of the time, in having the windows open day and night. Thinking seaweed might help the tuberculous, with twelve patients as controls he gave infusions of seaweed, and spread this material around their beds. The experiment appeared to be successful, the mortality was reduced, and the cough and sputum of the patients seemed to diminish.

It was during seclusion in Brittany that the opening passages occurred in one of the most celebrated duels of medical history, Laënnec and Broussais being the principals. In the face of popular opposition, practically alone, Laënnec combatted and annihilated a generalization which was the creation of the vain and fiery Broussais. Their differences dated from student days. Broussais, who was eight years the senior of Laënnec, was finishing work under Corvisart as Laënnec was starting. They frequently met at the bedside, and on a certain occasion disagreed on a diagnosis, Laënnec insisting upon empyema, and Broussais on pneumonia. Laënnec's work as a pathologist no doubt had taught him how often empyema was overlooked. Broussais claimed that the fullness noted on one side of the chest was due to pneumonia. Laënnec argued that such fullness in cases of pneumonia might be apparent rather than real because of imperfect exhalation. Since the fullness in this patient's chest was real it could be due only to empyema. The treatise on auscultation unfortunately mentioned this incident, omitting the name of Broussais. In another place Laënnec accused Broussais of forgetting his debt to Bayle. The egotistical Broussais was terribly chagrined to read the reference to his error in diagnosis, and in the second edition of his book, "Examination of Doctrine," he vented eighty pages of wrath on the head of his critic. Broussais scoffed at every line of Laënnec's writing, and in a venomous and relentless fashion attacked him in the interest, as he says, of science and humanity. "What are these tubercles," he asks satirically, "of which Laënnec relates the phases of development, as if he had been in the body of the sick when this matter first appeared?" In another passage he writes: "To stop at the pneumonia diagnosis with the different degrees of engorgement without adding methods and indications for treatment is to fail in purpose and to encourage readers to satisfy their curiosity by autopsy rather than with the desire to prevent the autopsy." Broussais in turn accused Laënnec of plagiarism. The latter, encouraged by his uncle, prepared a reply in the hermit retreat at Kerlouarnec, but forbore to publish this when he found that some friends had undertaken his defence. After the return to Paris, he answered Broussais in his clinics, which were attended by physicians from every corner of Europe. On December 2, 1822, Laënnec delivered his opening lecture as professor in the College of France. In an ingenious parable he compared his adversary to a drunken Paracelsus; though the name of Broussais was not mentioned, few missed the point of the parable. The opening sentence reads:

> The aim of medicine is the cure of the sick. A multitude of ways have been attempted to that end, and the number as well as the variety justifies the scepticism which medicine has often inspired, so debasing it with all the lighter minds and with the crowd incapable of discernment and of distinguishing facts from shadows with which ignorance, vanity, and often the most shameful passions have surrounded them. These ways so diverse in appearance can, however, be reduced to three categories, the empirics, the etiologists, and the observers.

Empiricism, he said, which is founded on changed circumstances, has placed in the hands of physicians such valuable remedies as opium, quinine and vaccination, but the empirical route is slow and leaves many gaps over the centuries. Laënnec ridiculed the fads of the day, and praised the methods of observation advocated by Hippocrates and Sydenham. The lecture, which reads delightfully even now, concludes with the hope that it will never happen to him to express what he thinks or what he conjectures, his point of view or his theory, for "*science is that which one knows.*"

In lectures at the Charité and the Faculty Laënnec lost no opportunity to disprove the fallacies of that strange generalization of Broussais which was called the Physiological Doctrine. This bizarre dictum ascribed all the vital processes to irritation, and all disease to excess or deficiency. Among other absurd claims of Broussais occurs the following: "Pulmonary phthisis may be prevented by putting an end by antiphlogistic remedies and revulsives, soon after its presence is discovered, to any existing irritation of the respiratory apparatus." Referring to melanotic cancers Broussais wrote: "This is all that it is important for the physician to know, and as to what M. Laënnec has written about black cancers I may as well say that it is the product of his imagination, a gloomy romance which I found difficulty in reading from the beginning to the end." Someone stated of Broussais: "His methods of teaching were Napoleonic, his therapeutics were sanguinary." Certainly his attacks were both. The two men were antitheses: one was tall, muscular, ebullient; the other short, valetudinarian, reserved. One fought passionately for an error, the other dispassionately for the truth, the one who was wrong had the medical world with him, the one who was right stood almost alone. The conflict made many enemies for Laënnec, the medical press was a solid phalanx of opposition to him, he became personally unpopular. Laënnec had neither the desire nor the talent to appeal to the mob; his work was "caviar to the general." The discussion soon became a war, the war of principles became, on the part of Broussais, a war of personalities. With the leader stooping to contemptible jibes at the meager frame of "Little Laënnec," the crowd could not be expected to refrain. Laënnec's discoveries were jeered, he was mocked in public. His physique was ridiculed, his skill impugned, his character maligned. The ideas with regard to the contagiousness of tuberculosis were laughed at, the suggestion of a tuberculous diathesis was scoffed, the suggestion that the disease was of a specific origin was treated with contempt. Students even resented the presence of foreign physicians who crowded the lecture rooms. The provinces joined with the capital in ignoring or ridiculing the author of auscultation.


PORTION OF A PORTRAIT OF RENÉ THÉOPHILE HYACINTHE LAËNNEC BY ALEXANDRE DUBOIS.

ILLNESS AND DEATH

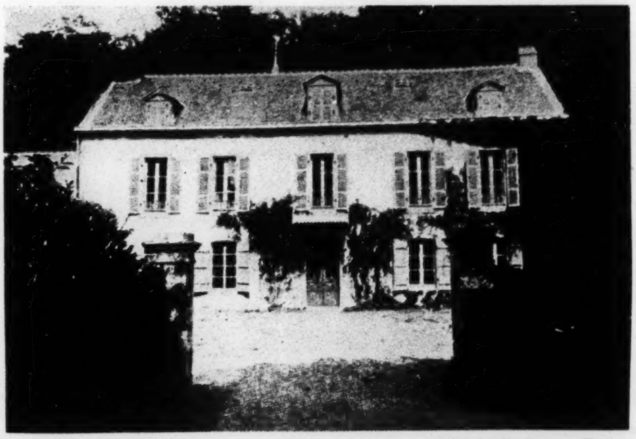
In 1822, moved both by pity for her loneliness and by love, Laënnec invited Madame Argou to take charge of his ménage. In 1824 she accompanied him to Kerlouarnec, together with his dogs Kiss and Moustache. There Laënnec "wearied his legs to rest his head," beyond that we know little of the vacation. By the year 1824 the malicious gossip of Kerlouarneç and Paris determined Laënnec to act. Love was possibly not the dominant factor in the situation, but rather convenience, convention and a mutual esteem. Certainly the principals could hardly be suspected of the grand passion. The widow was forty-four or forty-five, and ill-health made her appear ten years older. By marriage she joined herself to an emaciated and asthmatic physician, who if he had been neither thin nor sick would still have lacked comeliness. This pair became one at the Church of Saint-Sulpice on December 16, 1824. The poetic father, whose penetrating gaze did not stop with the somewhat ludicrous externals of this *mésalliance*, managed to celebrate the nuptials with the tenderest of hymeneal verses. Despite the distractions of this mild love, Laënnec had prepared a second edition of his treatise in 1823, which was almost a complete work on general medicine, including treatment of nose and ear diseases.

Laënnec about this time visited Bordeaux to examine a wealthy Spaniard in whom a cavity was suspected. He was offered ten thousand francs for the visit, and fifty thousand if he could effect a cure. On examining the patient Laënnec could not find pectoriloquy, but warned the attending physicians that the absence of this sign might be a result of a collection of pus in the cavity. That very night the cavity drained, and the next day pectoriloquy was easily detected. In another patient by means of percussion a cracked-pot note was found and the cavity was therefore described as superficial.

It happened that Laënnec had need of the wealthy Spaniard's fee, for like other professional men attempting business, he lost sixteen thousand francs in a land drainage speculation, the sea having overflowed during an equinoctial storm. Litigation resulted, and under this worry and that caused by the revision of his book, the nervous organization completely broke down. In April of 1826 he contracted a severe cold, but continued at work. A throat condition followed, accompanied by high fever and pains in the chest. For a time Laënnec thought this might indicate a third tuberculous collapse, but Mériadec was unable to detect any unusual pulmonary condition. He was twice bled, and after the second bleeding, when he was in a semi-erect position in bed, Laënnec noted "a heart murmur perceptible at a distance." He immediately added this observation to the book.

Gradually he recovered so that he was able to ride about and enjoy the parks and trees of Paris. The "Treatise on Auscultation" was entered for a valuable prize which the Institute of Medicine bestowed for the best medical work of the year. The author claimed that he had given inspiration in his clinics to three hundred physicians during the year 1825, and advanced the merits of his discovery and researches. To his disappointment the prize was awarded to the inventors of sulphate of quinine.

In May Laënnec was attacked suddenly with a diarrhea. Mild attacks had formerly served a beneficial purpose, but now he was also the victim of fever and sweating. He commenced to cough, the expectoration being markedly fetid. Auscultation was now less reassuring, slight pectoriloquy was suspected below the left clavicle. Hoping that Brittany might effect a cure, as it had before, he obtained a congé from the Duchess de Berry, and made preparations. On the thirtieth of May, feeling somewhat better, Laënnec with his wife started in an open carriage for the beloved home. The journey was long and exhausting, interrupted by accident and illness, the diarrhea improving and relapsing. The weather was not auspicious, the patient chilled by constant wind and rain. An infected upper molar tooth was discovered and extracted; a great deal of fetid pus was discharged, probably from the antrum. It is the conjec-



KERLOUARNEC, THE HOME OF THE FOXES, AT PLOARE, WHERE LAËNNEC DIED. FROM ROUXEAU.

ture of Rouxeau that all symptoms, including the cough and diarrhea, were due to this infection. Along the way an old friend and pupil, Toulmouche, auscultated Laënnec and found nothing serious. On the fourth of June, while the invalid was reading a prayer-book at the line "Ora pro nobis," the carriage was thrown into an eleven-foot ditch, with coachman, passengers and horses. They were terribly shaken, but otherwise not harmed. During the journey Laënnec was taking opium to control the diarrhea. At Quimperle another pupil, Beaugendre, auscultated but could find no evidence of pulmonary disease.

After ten days Kerlouarnec was reached, but the invalid was so exhausted that he feared a galloping consumption, expecting to die within a week. Physicians assured him that they could hear nothing abnormal with the stethoscope, but the patient insisted that he could if he could only use the instrument. He was resigned and gentle, manifesting none of the petulance of the sick, and even dictating his own bulletins. The active fever continued, the expectoration was very profuse, and pus still was discharged from the maxillary sinus. Laënnec reported that, since he could take one and one-half liters of emollient enema in his lower bowel without distress, his large intestine must be healthy. He craved the out-of-doors and a view of the farms, so he was carried in his chair under the trees or wheeled around the farms and to the chapel of Sainte-Croix. Meanwhile the diarrhea waxed and waned, a violent chill occurred, though the sputum diminished. His diet was goats' milk and whey. Beaugendre found a hard and irregular tumor in the abdomen, and Laënnec's cousin Ambroise came from Nantes to make an examination. This physician found bronchophonic resonance, the respiration generally vesicular, mucous and sibilant râles at the base of the left lung. He dissented from the opinion of Mériadec and Recamier who suggested pectoriloquy under the left clavicle. This cheered Laënnec; he said "he hoped for little and feared nothing." And he again rode in his carriage around the estate. A question now arose as to pectoriloquy at the angle of the left scapula. The faithful son now wrote last words to his beloved father, praying God's benediction for him, and communicating his own resignation in the face of death. "Il me semble que je désire plus de paraître devant lui (Dieu) en ce moment que dans un autre." July was a hot month; the dysentery returned and Beaugendre intimated to Mme. Laënnec that the end could not be far away. In spite of the combined heat and weakness, Théophile contrived in July to walk daily in the garden.

Seventeen days before his death a courier from Paris brought a letter saying that the request of the Duchess of Berry for an Order of Saint-Michel for Laënnec was refused. In a last note he wrote, Laënnec compared his case to that of Madame Chateaubriand. Towards the end a violent fever and delirium set in. In one of the rare intervals of lucidity, on the last day of life, Théophile withdrew the rings from his fingers, saying that he would spare some loved one that melancholy task. He then sank into a comatose state, and at 5:30 o'clock of the thirteenth of August, 1826, he expired.

There was no autopsy; the corpse, which weighed less than one hundred pounds, was buried in the parish churchyard, facing toward the large cemetery Calvary. The stricken father made a sad attempt to embody his grief and pride in an epitaph.

Victor Robinson ends a delightful chapter on the life of Laënnec with these words:

> His name remained the greatest in the history of tuberculosis until that epochal evening two generations later, when Robert Koch read his paper, "The Etiology of Tuberculosis," announcing that a short rod-shaped bacterium was the sole and only causative agent of the universal scourge. Suffering mankind now awaits him who will discover a remedy to destroy Koch's bacillus. In high expectation Koch himself proclaimed that he had found a specific; but tuberculin is a stain—the only one—on the Hanoverian's bright escutcheon. The Jenner of

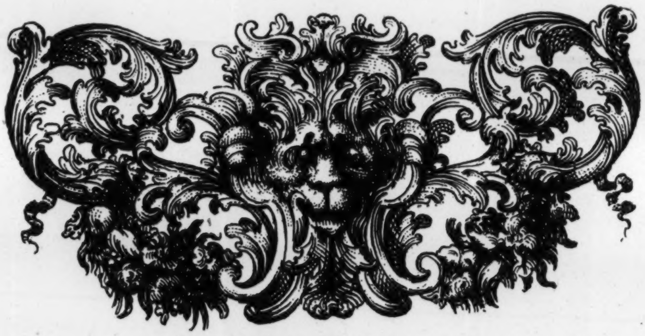
tuberculosis has not yet arisen; when he comes, when he brings to the medical market the blessed drug that will materially help transform consumptives into normal human beings, the historical student will share in the general rejoicing, but he will not forget how much the world owes to the previous labors of Théophile Laënnec.

It is sad to think that Laënnec did not live, as did Pasteur, to enjoy the plaudits of mankind, and to reap the reward of his labors and his discoveries. Living, his renown was unsung, but later generations have striven to repair the negligence of his contemporaries, and he who met with little but obloquy and ridicule in life has been praised with a unanimous voice by a more discriminating posterity. Though Laënnec met with no general acclaim, he must have known that his life and work were not in vain. Certainly we as physicians can well attest his success when we recall his words: "I shall consider it ample, yea more than sufficient reward for my labor, if it should prove the means by which a single human being is snatched from an untimely death."

ICONOGRAPHY

There is only one authentic portrait of Laënnec, that by Alexandre Dubois, painted in 1812, but dated 1813 to enter the Salon. In a letter describing this portrait, Laënnec considered that the painter had achieved for his sad figure the same prodigy that Minerva did for Ulysses when she wished him to find favor with the King's daughter. Dubois later added in the lower left corner a stethoscope lying on some old books.

Two designs were made by Nannoni for medals in 1844. Tardieu made an engraving, which is mediocre and lifeless. It was designed in 1823 to be placed with an article on Laënnec in the Biographie Médicale.



[From Redi: Sonetti. Firenze, 1702.]

AN OLD ICELANDIC MEDICAL MANUSCRIPT[1]

By HENNING LARSEN

IOWA CITY, IOWA

THE recent growth of interest in the study of medieval science has made itself strongly felt in the Scandinavian field. We have long known Norway and Iceland as the home of the Eddas and the Sagas; we have known them, too, as central forces in the great period of expansion known as the Viking Age. The investigator has led us into the more intimate life of everyday—the beliefs and superstition, the daily cares and tasks, problems of sustenance and of sanitation. We have followed the gradual importation and assimilation of West European culture: religion, customs, manners, art and science. It is, then, only natural that investigation of the medical lore should follow. Some work has been done from time to time for years in monographs of more or less pretentious character; and the publication of texts was begun as early as 1860 when Konrad Gislason published an Icelandic medical fragment in his "Fire og Fyrretyve Pröver."[2]

More recently the publication of texts has been continued by Kr. Kålund and Marius Haegstad for Norway-Iceland, while for Sweden and Denmark the work commenced by Molbech has been continued by Marius Kristensen and J. W. S. Johnsson. The analysis of the material has been further carried on by Dr. Fr. Grön, Finnur Jonsson, I. Reichborn-Kjennerud, Hjalmar Falk, Nils Lid, A. Fonahn and others.[3] Particular attention has been given to the popular traditions and to folk medicine.

Considerable interest was roused, therefore, when it was announced a few years ago that an Icelandic medical manuscript had been discovered in the library of the Royal Irish Academy, Dublin. The manuscript now numbered 23 D 43, was found by the Celtic scholar Mr. Edward Gwynn, Fellow of Trinity College, while he was engaged in the cataloguing of the Celtic manuscripts of the Academy.[4] Mr. Gwynn turned the manuscript over to Professor Carl Marstrander, then of Dublin, now of Oslo, for investigation. Professor Marstrander, with some aid from Professor Oluf Kolsrud, made a complete transcript of the manuscript, which proved to be the richest one yet discovered in Scandinavia. Too pressed by other investigations to carry on the work with the manuscript Professor Marstrander offered me the use of his material if I would complete the task. To make the material available not only to philologists but also to medical historians, it was agreed that an edition should be prepared with a complete translation into English and with a full historical as well as philological introduction and vocabulary. Such an edition I hope to send to press some time this year.

After making a preliminary study on the basis of Professor Marstrander's transcript, I went to Dublin to consult the original manuscript, and whatever I give in this paper is based on a complete collation of this transcript with the original.

The manuscript is a small octavo volume, about 5¾ by 4½ inches, of 73 leaves and a small strip of vellum inserted and numbered as an additional leaf. Except for two pages, it is well preserved, though stained and browned from exposure, a characteristic true of almost all manuscripts preserved in Iceland, where they usually have been kept without great care in damp and possibly smoky cottages. It is written in a clear hand, partly in black, partly in a brownish ink with chapter headings in red (now badly faded) and with initials in red and in green. The manuscript is plain and devoid of all elaborated decoration or illuminations common in Continental manuscripts and unfortunately has none of those elaborate illustrations of herbs or of animals found in the medical manuscripts of England and the Continent. This, which at first thought might seem merely an artistic loss, because so many of the illustrations of the English manuscripts prove fanciful and inexact, clearly made by an illuminator lacking knowledge both of medicine and of natural history, is nevertheless a real loss to medical history; for such illustrations often give a clue to relationships not made evident by the texts themselves. Thus Dr. Charles Singer of London University has determined contacts between English and Continental manuscripts based on just such parallels in illustrations. Linguistic and paleographic evidence places the manuscript in the fifteenth century, in the second half rather than the first. It is written almost wholly in the Icelandic dialect and shows both spellings and vocabulary peculiar to Iceland. That the manuscript has remained in Iceland after its completion and has been used there is evident from marginal notes in later hands also showing Icelandic spellings and including three Icelandic place names all from the north of Iceland not far from the intellectual center Holar. That the manuscript from there was carried to Copenhagen is almost certain. This assumption is borne out by the fact that a copy was made of it in 1756 by someone writing with peculiar Danish modifications of the language and that this copy was secured by Trinity College Library, Dublin, in the year 1800 from the Reverend Mr. Johnstone, then chaplain of the British legation in Copenhagen.[5] How the original later came to Dublin no one knows.

One more bit of the history of the manuscript and one confirming the above conclusion, came to me on one of my last days in Dublin. Thanks to an unusually bright and sunny day, I was able to make out a title almost faded away. This read: "Here begins the leechbook of Thorleif Björnsson." A Thorleif Björnsson was governor of Iceland, under the Norwegian Crown Council, from 1481 to 1486, and in 1480 he had been made lay brother of Munkeliv Monastery in Bergen, Norway, one of the greatest centers of learning in Norway at that time. I believe, then, that the medical manuscript was prepared for Thorleif Björnsson by Icelandic scribes who secured much of their material from the monks at Munkeliv in Norway.

This theory is also borne out by the fact that throughout the manuscript there is a substratum of Norwegian forms not fully eliminated by the Icelandic scribes. Back of this again are Danish forms retained from still earlier Danish sources.

The contents of the manuscript fall naturally into seven divisions:

1. Charms and conjurations against hemorrhages, fevers.
2. A brief chapter on the depth of the sea (the only part of the manuscript not dealing with medicine or related subjects).
3. A book of simples and their efficacy (i.e., uncompounded medicines, chiefly herbs, but with not a few mineral and animal substances).
4. An antidotarium (i.e., book of compound medicines).
5. A lapidary (on the medical use of gems).
6. A leechbook (or possibly parts of two) listing ailments and their treatment. Though now almost obliterated in an accretion of folk remedies and through constant addition and rearrangement, there is evident back of the whole the original anatomical arrangement "from head to foot."
7. A cookbook. This can possibly be considered of medical importance though it contains none of the standard rules on dietetics found in many of the medical manuscripts of the time.

This material falls rather naturally into two groups, at least if we pass by the chapter on the sea and the cookbook. In one would fall all that bulk of superstition and unscientific material inherited or developed from the traditions of the dark ages or from old superstitions of the Romans. And in the second would fall the scientific medicine logically worked out on the anatomical, physical and chemical theories then prevalent.

The nature and sources of all this conglomerate material present a rather complex problem. In the first group, the unscientific, the charms are of chief interest. They are not many in number and involve nothing but bleeding and fevers. A great number of parallels exist for most of the charms in Icelandic, Norwegian and Danish collections.[6] They can then safely be set down as common to all Scandinavia and may well be of wider range. The bulk of them have bits of church ritual in them, but some of the material as well as the general tendency to use charms may safely be ascribed to pagan times. They have no element of scientific medicine even of the most warped or corrupt form.

A few illustrations will make clear their general nature.

1. Fol. 1r.

For a fever it is good to cut this on an apple or an onion:

Hasis eos trema. neos salvator emanuel † has himas agios fremaos salvator, vao, fao, fao.[7]

2. Fol. 1r.

For a flux:

Cesma pater in stramilla mihi non olcimaris
Sta sanguis sicut stetit flumen in Jordanis
Sta sanguis qualis pater, talis spiritus sanctus
Incrassatus pater, Incrassatus filius, Incrassatus
Spiritus Sanctus.
Pater noster, our father, stand thou by while the Son
Stops my blood that is now running from this vein.
Adveniat regnum tuum, thy kingdom come, that thou mayest stop my blood as St. Mary stood in the Jordan. Sed libera nos a malo, Amen.

3. Fol 2v.

May the red which I see running be stopped. Saw I brand burning, blood running. Stop thou, Blood! Our Lord stood still while he created heaven and earth and all God's creations. Restrain the waves of thy blood that veniat regnum tuum, fiat voluntas tua, Dominus Jhesus Xristuc. fres ✠ prares ✠ res ✠ pax ✠ vax nax ✠ Amen.

In this group of unscientific remedies must be classed many of the folk remedies of the leechbook. In its very nature the leechbook is destined to be a favorite among common people. In fact such handy-volumes can still be purchased in this country and elsewhere, in many languages. They were therefore subject to constant reworking and to additions from popular superstition. Other additions are from the nastinesses of the monk medicine of the dark ages. To sift out which bit is from local tradition, which from monk medicine, and which from Latin leechbooks is impossible.

A sample of treatment for nosebleed (Fol. S. 21v):

> Bind the big-toe of your right foot with a strong string, then it will be stopped. [This remedy I believe still is in use.] Then burn to ashes swine's excrements in a kettle and blow the ashes with a tube into the nostrils.

Another cure involving the old superstition of the influence of the moon (Fol. S. 10r):

> If a man cannot hold his needs, take the bladder in the river-fish and swallow three days during the waxing moon and another three days during the waning moon, then he will improve.

To unscientific medicine, too, belongs all of the lapidary. In our manuscript only an introduction and two chapters are preserved; but the Trinity College copy above referred to has an additional list of twenty chapters treating twenty gems. That this was in our manuscript is certain, but for some reason or other the leaves, the last in the volume, have been cut out. Enough is preserved to show the section to be the translation of a similar Danish work preserved in a manuscript from about 1300. This Danish lapidary is based on two medieval Latin works, the "Poema de Lapidibus Pretiosis," possibly by Marbodus, bishop of Rennes (who died in 1123) and a lapidary by Arnoldus Saxo from the early thirteenth century. Many of the medieval lapidaries go back to Pliny's "Natural

History" and have passed on from him to Isadore of Seville (636 A.D.) and others.[8]

The nature of the lapidary is best brought out in the introduction itself (Fol. 53 v).

> Ewax king of the land called India writing to Nero the emperor makes known what are true gems and also the color, and the power of each, as well as where and how each of them is found. All true gems have the power which the book explains; but if they have not that power they are imitations, stained and laid among other stones and falsely made like them. If one wants genuine stones to carry out their virtue as the book says, those must be set in gold that it suits and those in silver or other material which fits them. So also some need to be carried on man's right side and some on his left. But if they are not carried or set as now said, they will not fully assert their strength.

The first chapter is of the amethyst (Fol. 53v):

> Amatista is the name of a true gem. And it has a reddish-blue color like a violet or rose. But some have a pale color. This stone must be mined. And it is good against harmful drink. It comes from India. It drives away evil thoughts, gives good understanding and lets a man stay awake.

Of greater interest still are the sections of the manuscript dealing with what I have termed scientific medicine. To this class belong the book of simples, the antidotarium, and parts of the leechbook, the real bulk of the manuscript.

The book of simples, it is fair to say, was to the compiler the principal section of the manuscript. It contains 147 chapters discussing in all 139 simples. Each chapter deals with one simple. Of the eight chapters we have more than the number of simples (i.e., 147 chapters—139 simples), 3 are due to erroneous division by the copyist, one is a Latin interpolation *Fermentum de farina*, and four are of phlebotomy.

The scheme of the book is the arrangement of the simples alphabetically (but only according to first letter). The Latin and the Norse, sometimes the Latin, Danish and Norse, names begin the chapters. Next follow the properties according to the system of Galen (i.e., hot, cold, wet, dry), and finally the value and use of each for specific diseases (F. ex. Fol. 9r):

> Argentum vivum, quick silver. That is very hot and very wet. It kills lice, fleas, nits, sheep-lice, and gnats. If one makes an ointment of it with oil and vinegar, it is good for scabies and blisters. Whoever drinks quick-silver drinks his own death . . . the smoke of it causes asthma and bad color and foul breath.

That we have to do with a work not of Scandinavian origin is evident to anyone, even one ignorant of medical history. In fact it has already been shown by Dr. Marius Kristensen and others that this book of simples and indeed the bulk of medieval Scandinavian medicine goes back to the School of Salerno. To make this contact clear, I shall make a rapid survey of the antecedents. As we trace our way back through the Middle Ages to the classical period, we find a great number of pharmacological studies of the general type of our Dublin manuscript. Most of these go back to the huge work Περὶ ὕλης ἰατρικῆς, i.e. "Concerning the Art of Healing" by Dioscorides, a Greek physician serving in the Roman army at the time of Nero.[9] Dioscorides was the medium through whom the later writers drew most of their knowledge of Hippocrates and his work.

The Hippocratic system followed by Dioscorides was finally established by the schematization of Galen (second century A.D.) whose theories dominated medicine until Renaissance times.[10] We find it dominant throughout the scientific part of our manuscript.

According to Galen the four humors of the body corresponded to the four elements: earth, air, fire and water. These humors and the corresponding elements have two essential characteristics. They are either hot or cold, dry or moist. Thus we have the fundamental scheme:

Fire	Cholera rubea	Hot and dry	Choleric
Air	Blood (sanguis)	Hot and wet	Sanguine
Earth	Cholera nigra	Cold and dry	Melancholy
Water	Phlegma	Cold and wet	Phlegmatic

Diseases resulted from an excess of any one humor. The illness once diagnosed, the treatment was simple and logical. One resulting from a hot and dry humor would be treated with a cold or wet drug and so forth.

Naturally pharmacology tried to determine the nature and strength of each drug. Was gold wet or dry? Was it hot or cold? And to what degree were these characteristics present?

This determination of the characteristics of medical substance was the main object of Dioscorides and from him we find the theories passing on to the Roman scientists from whom they received practical application.

But there came a time when it seemed as though all the accumulated learning of the ancients would pass into oblivion, not only the theory of pharmacology but of all medicine. With the destruction of the Roman empire, medical science received a great setback. The magic and superstitions of the barbarians and the quack medicine of the unlearned monks more or less supplanted the scientific work of the ancients, until finally, partly through the work of the Arabs, a return to Greek medicine was effected.

In Europe the School of Salerno was the main force.[11] When elsewhere Greek language and Greek learning were forgotten, the old colonies of South Italy did not entirely lose contact with their traditions. Here then we find a return to ancient medicine as early as the ninth century. In the eleventh century the movement came to a real head in the work of Constantinus Africanus of Carthage, who was brought to Salerno by Duke Robert the Norman. Constantine (*ca.* 1020–1085), a translator and a plagerizer to the nth degree, has nevertheless the credit of bringing to Salerno a fusion of Greek and Arabic learning which made of that city the greatest medical center of Europe prior to the rise of the school of Montpellier. One of the most important of his works, and the only one bearing on our study is "De Gradibus Simplicium" based on Dioscorides and carrying his and Galen's theories to their absolute logical ends. This work was the source of the two famous Salernitan works, Platearius' "Circa Instans" and Macer Floridus' "De Viribus Herbarum."[12] The influence of the work is possibly also seen in the "Antidotarium Nicolai" and the "Regimen Sanitatis." These works are all of the late eleventh or of the early twelfth century. They spell the greatest rise of Salernitan medicine, and they give us, also, the sources of practically all the scientific sections of our Icelandic manuscript.

In Scandinavia Salernitan medicine arrived at an early date, possibly about 1200. The Danish court physician, Henrik Harpestraeng (d. 1244), was the chief agent. Tradition has it that Harpestraeng served at the court of Valdemar II of Denmark (A.D. 1241) and wrote certain medical tracts for him and for King Erik of Denmark, who came to the throne at the death of his father Valdemar (1241). For some time scholars have doubted the position ascribed to the prominent physician, but in recent times the investigations of the Danish physician and medical historian, J. W. S. Johnsson, and the philologist, Marius Kristensen, have made it practically certain that much of the Salernitan literature of Denmark owes its origin to Harpestraeng or Henricus Dacus or Maistre Henry de Danemarche as he is also called. Records show that he was prominent in medical circles in Orleans, France, in 1185, and Marius Kristensen believes it possible that he also studied at Salerno.[13]

Most important of Harpestraeng's literary works is an herbarium similar to the book of simples of our manuscript. This has come down to us in two thirteenth century manuscripts (preserved, respectively, in the Royal Library, Stockholm, and in the Royal Library, Copenhagen) besides in various shortened and much altered versions of later date. That the Harpestraeng herbariums have had as source the Salernitan poem "De Viribus Herbarum" ascribed to Macer Floridus (*ca.* 1100 or a little later) was recognized as early as 1826 by Molbech,[14] the first editor of the Copenhagen manuscript. Recently Marius Kristensen has proved that a second important source is Constantine's "De Gradibus Simplicium" and that to it or Macer Floridus almost every chapter can be traced.[15]

From Denmark this herbarium (or as it should rather be called "book of simples") was brought to Norway before the middle of the fourteenth century. A small fragment of a West Norwegian translation is still extant and has been edited by Marius Haegstad.[16] Two even smaller fragments of the same version have passed to Iceland and been incorporated in the Icelandic leechbooks A.M. 194,[17] written in 1387, and in the A.M. 434 from the fifteenth century.[18] But before the discovery of the Dublin manuscript nothing approaching a complete herbarium had been found either in Norwegian or Icelandic.

Professor Marstrander's first move when he secured the Dublin manuscript was to compare it with the Norwegian and Icelandic fragments and their Danish original. Even a casual reading made clear that the Norwegian and the Dublin manuscripts were of the same group. A more detailed investigation showed that a manuscript of the Copenhagen type (though not that particular one) is the source of all the Norwegian-Icelandic versions; and that the Dublin manuscript goes back to a common (now lost) ancestor with the Norwegian. The conclusion is that a complete Norwegian version of the Harpestraeng herbariums existed shortly after 1300 and that from it the Norwegian fragment and the Dublin manuscript hail.

But to many the nature of the medical practice taught may be of more interest than the history of the manuscripts and of the gradual dissemination of Italian learning through Scandinavia. The book of simples shows plenty of examples both of the more or less fantastic uses of medicinal substances and of the more common practices that have survived in the home medicine of our day.

Of the 139 simples listed the great majority are herbs. In identifying these we meet three difficulties: First, the question of identity of the herb specified in the Latin originals. Of this problem I am not qualified to speak but have had to trust to specialists in historical botany. The second is the Danish translators' understanding, or misunderstanding, of these names.[19] And the third is the unstable nomenclature of the Scandinavian languages that may lead to different interpretations of the Norse names.

The following are of the more common simples, many of which are still officinal (I have in each case given first the name as found in the manuscript):

Absinteum malurt (fol. 4r) = Artemisia absintheum, wormwood.
Abrotanus abrot (5r) = Artemisia abrotanum, southernwood.
Artemisia bugras (5r) = Artemisia vulgaris, mugwort.
Arnoglossa sive plantago (5r) = Plantago (of several kinds), plaintain.
Apium merki (6r) = Apium graveolence, celery? Or is it as O. E. merece = smallage, water-parsley?
Allium kloflaukur (6r) = Allium sativum, garlic.
Altea (without Norse name, 6v) = Althea officinalis, marsh-mallow.
Aristologia holurt (6v) = Aristolochia clematitis, birthwort.
Alsa (sic! without Norse name, 8r) = Ferula Asafoetida (imported).
Anetum dils (8r) = Anethum graveolens, dill.
Acedula sura (8v) = Rumex acetosa, sorrel (but Macer evidently meant Sedum acre, wall-pepper. M. Krist.).
Berberis (9r) = Berberis vulgare, barberry.
Basilica sive genciana skarsaeta (9v) = Gentiana purpurea, gentian.
Betonia jord humli (10r) = Betonica officinalis, betony. Or does the Norse name demand correlation with Icl. *jardhumal*, Swedish *jordhumle* = yarrow or St. John's wort? Cf. Schübeler: *Viridarium Norwegicum* II, 389.

Terisolium[20] kirfill (11r) = Anthriscus cerefolium, chervil.
Saulis Romana (11v) = Caulis romana—some form of Brassica, cabbage.
Calamentum akur mynta (13v) = Nepeta cataria? Catnip. Probably originally = Clinopodium calamintha, calamint, cf. Dioscorides (Berendes transl.) p. 328 Περὶ κλινοποϑίον where the same uses are listed.
Cepa er vinan (sic! = unian) (5r) = Allium cepa, onion.
Camomilla hvitvid in Danish but in Norse balldebra (15v) = possibly Matricaria chamomilla, daisy, doggowan.
Eupatorium id est salvia agrestis (16r); the second name points to sage.
Elleborus thung in Danish (16v) = Veratrum album, white hellebore and helleborus niger, black hellebore.
Feniculus fenkel (17r) = Feniculum officinale, fennel.
Ysquiamus farens yrtt (19r) = Hyosciamus niger, henbane.
Lectuca (19v) = Lectuca sativa, garden lettuce.
Lapacium borrablad eda haevindla (20r) = Lappa, burdock.
Menta myntta (21r) = Mentha viridis? (cf. M. Krist.), mint.
Marubium blinda natla in Danish (23r). The Latin name suggests Marrubium vulgare, horehound; the Danish rather Lamium album, dead nettle (M. Krist.).
Nasturtium krasse (23v) = Nasturtium officinale, water cress, or Lepidum sativum, pepper grass (M. Krist.).
Origanum kongur (24r) = Origanum vulgare, wild marjoram.
Petrotilium petertilia (26r) = Petrosilenium sativum, parsley.
Pastinack mora in Danish (26v) = Dacus carota, carrot, as the Danish name indicates, rather than Pastinaca sativa, parsnip.
Pulegium (27v) = Mentha pulegium, pennyroyal.

A great many of these herbs have grown wild in Scandinavia or have been cultivated in monastic gardens. Other simples equally well known have been imported from the Orient or from South Europe. Among these we find many of our commonest spices: Balsam (9r), laurel (9v), cinnamon (12r), cardamom (12r), camphor (12v), cassia (12v), costus (12v), calamus (14r), galingale (18v), cloves (18v), mace (22r), myrrh (22r), pepper (28v), mustard (32r), spikenard (33v), ginger (39v), zedoary (40r).

Of mineral and animal substances (mostly from Constantine's "De Gradibus" we have gold (4r), silver (4r), ambergris? (7r), alum (fol. 7v), quick silver (fol. 9r), bitumen (fol. 9v), lime (fol. 14v), Spanish green (fol. 16r), vitriol (fol. 17v), iron rust (fol. 18r), musk (fol. 22r), saltpeter (fol. 23v), salt (fol. 33v), sulphur (fol. 35r), magnet (fol. 23r).

The uses of the simples are not complicated. They are: (1) making a decoction in wine, water, vinegar, or oil, which, then, with or without other foods or medicines, is to be taken internally; (2) pounding or beating and using as above; (3) the application of such decoction or mixture externally; (4) the use of the plant or the extract with some fatty substance to make an ointment or poultice.

The choice of medicine is based on a simple but logical theory. Most commonly we find applied the doctrine of opposites, i.e., a cold drug for a hot disease, and so forth. It seems, too, that we have a trace of the doctrine of like for like (though this may be due to a mistranslation on the part of the Harpestraeng). We have, thus, silver, a cold drug, used for cold diseases.

A few illustrations will clarify matters. First of the handling of the herbs:

1. Boiling.

Water from boiled wormwood absinteum is good for sore eyes [4v].

Plantain. If one boils it like greens with salt and vinegar and groats, it is good for diarrhea [5v].

Garlic. If one boiled garlic with honey and drinks, that is good for diseases of the lungs.

If it is boiled it is good for a cough [6r].

2. Crushing.

Chervil. If it is crushed with honey, it helps for the disease called cancer [11r].

If one drinks chervil juice and applies crushed chervil to his genitals, then will be opened those channels through which the urine is to pass out.

3. External application of decoction or juice.

> Plantain. It is good for a flux if crushed and applied. And if tempered with the white of eggs, it helps very well both burns and bites of dogs [5v].
>
> Garlic. If one boils it with beans and rubs his temples with it, that is good for a headache [6v].

4. Use in ointment or as poultice:

> Southernwood (Abrotanus). If one crushes it with tallow and rubs his eyes that helps [5r].
>
> Mugwort (artemisia). If it is crushed with paunch fat it is good to bind upon tumors [5r].
>
> Quick silver. If one makes an ointment of it with oil and vinegar, it is good for scabies [9r].

The theory of opposites is frequently expressed definitely:

> Arnaglossa sive plantago. It is cold in the first degree and dry in the second. It dries a too wet wound and cleanses it, if tempered with honey and applied [5r].
>
> Barberry is dry and cold in the second degree. It relieves cough and heat, strengthens the liver, and cools a hot swelling if applied [9r].
>
> Bitumen Judaicum is hot and dry in the third degree.
>
> . . . Smoke of it is good for quotidian fever and for whatever by nature has cold and wet blood [9v].
>
> Lettuce is very cold and wet. If one eats it that is good for overheating [19v].

The theory here illustrated naturally leads to the use of one simple for a wide range of diseases. Undoubtedly, too, the theory is often forgotten, and popular use of a common simple is added to the already varied categories. To indicate the almost kaleidoscopic result let me quote one chapter in full, the chapter dealing with the efficacy of the rose (fol. 31r).

> Rosa is rose, dry.
>
> Rosa is the rose, dry and cold in the first degree. If one crushes rose and applies to erysipelas, it helps. It is good for too much heat of the stomach or the heart. Roses crushed and drunk with wine are good for diarrhea. All eye-ointments should have the juice of roses. If one dries roses and crushes them fine, that is good to put in the mouth with honey for sores of the mouth. If one drinks fresh roses crushed with honey it is good for great heat. If one wets the beehive with rose-juice and milk, the bees will not go away. Roses are also good for the sting of the spider. If one crushes roses with salt it is good for a swelling on the body though it be old. A woman too may be purged with rose juice boiled with salt. The same, too, is good to drink for pustules which come internally. It is also good for dysentery. Salt and roses crushed together is good for dog's bite. If one holds rose juice in his mouth, it is good for the teeth. If one crushes roses with honey and rubs upon the eyes that lets him see well.

Though our book on the whole shows a logical and rational practice, we find also examples enough of lapses into fantastic superstition:

> [Fol. 10v.] Betony . . . If one makes of this herb while it is green a ring around serpents, they do not at all dare to cross it. Rather do they fight and strike with their tails till they die. Whoever wears this herb upon himself will get no harm from dangerous leechdoms.
>
> [Fol. 17v.] Fennel. Vipers when they grow old all eat fennel and become young; and therefore it is good for old men to eat fennel.

Possibly second in importance to the compiler of our manuscript, but certainly first in importance to us is the antidotarium, the book of compound medicines. Before the discovery of the Dublin manuscript not even a fragment of an antidotarium had been found in any of the Scandinavian countries. The only evidence of the existence of such a work in the North is the reference to a few drugs found in the sagas and in other manuscripts.[22]

Our manuscript has in all fifty-three chapters listing the names and uses of sixty drugs. The immediate source of this section I have not found; but the ultimate source is the "Antidotarium Nicolai"[23] and other related writings of the School of Salerno.

The "Antidotarium Nicolai" as I have already stated in my outline of Salernitan medicine, is a book of compound medicines composed in Salerno about 1100 or shortly after. For many years it has been supposed that the author was one Nicolaus Praepositus, who because of his surname was looked upon as kind of dean of the medical school of Salerno. This Nicolaus was also said to be the author of a "Dispensarium" called "Dispensarium Nicolai Praepositi." Modern scholarship has years ago divided this mythical dean into two and shown that Praepositus is of much later date and is the author only of the "Dispensarium."[24] Recently the Swiss scholar, Dr. Sigerist, has gone even further in the annihilation of poor Nicolaus in his recent study of medieval pharmacology, in which he claims Nicolaus is merely a fictitious name and that no evidence can be found for the existence of the famous doctor.[25]

Whatever be the final fate of the worthy doctor, we know that the book that bears his name dominated the pharmacology of the Middle Ages and inspired a great many other works, partly comments on the original, partly adaptations of and additions to it. And it is one of these modifications that has wandered to the far north and has come down to us in its Icelandic garb.[26]

Of the sixty drugs in our manuscript forty-four follow closely, often word for word, the "Antidotarium Nicolai." Of the remaining sixteen, eleven are paralleled in related works, three are merely duplications. There remain then two chapters for which I have not yet found sources or parallels. These I suspect of being duplications or garbled versions of others for which we have sources. The identification is made difficult by garbled forms of the names and by absence in the Icelandic version of the detailed prescription.

The list of drugs in our antidotarium is not limited to what we think of as antidotes. We find first a list of ointments, oils and plasters (to be more exact: ten ointments, one oil, one plaster) followed by a great number of electuaries, leechdoms and antidotes, and finally a group of cathartics. Of the latter at least one is in the form of pills (Paulinum 52v).

As an illustration let me quote one chapter (fol. 51r):

> The Immortal Leechdom called Athanasia.
>
> Athanasia is the name of a leechdom which in Norse one may call Odaudleg (i.e. immortal), for so the name is to be interpreted. It is particularly good for the fluxum sanguinis which women have. One shall temper it with the juice of plantain and shall take first the red hematite called hemathites and alternately dip it in the liquid and then whet it upon a hone until all the liquid is red as blood and afterwards, with the liquid, temper the Athanasia until like blood and then give it to women to drink. You shall also take . . .[27] and roll together about the size of your finger and put it afterwards in this leechdom and this liquid all mixed together until both saturate and cover it and then make of it a suppository often and regularly as the leechdom prescribes to them who need it. This and the same leechdom tempered with the juice of plaintain and hematite helps those who spit blood which in Latin is called Hematoici. If it is tempered and put like a little swab in the nose it binds and helps nosebleed and stops it. One shall give at one time fifteen pennies weight with the liquid already mentioned. And it gives great help and aid for three kinds of dysentery. That is one when man is excessively loose in the bowels; the second is if a man cannot hold his needs; the third is the one that the food . . . a man when he eats.[28]

I have chosen this particular illustration because it gives the best example of the cure of "like for like." The medicine stained red with hematite is good for menstruation, for nosebleed and for hematosis.

The last section to be considered is the leechbook proper. In listing it as a section showing also scientific medicine, I have made a rather risky statement. A reading of the whole leaves one an impression of a conglomeration of nonsense. Superstition is heaped on superstition; nasty cure from popular tradition follows nasty cure; and logic seems the last thing to be found. Here are traditions as old as Pliny, and notions from the contemporary Scandinavian, and an accumulation of popular usage from the whole intervening time. But throughout it all, we find scattered the theories and practices of the book of simples still retained and apparently backed by the same logic.

To find any one source of this mass is impossible. We have three Icelandic and one Norwegian manuscript of the same type and practically everything of those four versions has here been consolidated. We have also one Danish manuscript of which much is paralleled in our manuscript. The version we have seems to be a collection and reworking of everything of this type available in Scandinavia at that date. As I have said before, we can faintly see remnants of an old arrangement on an anatomical basis, beginning with ailments of the head and concluding with those of the feet.

The leechbook, as preserved in our manuscript, is fragmentary and is confused in binding. We have, though, one section clearly the beginning of a leechbook. After an introduction about Hippocrates, already quoted, we have a Prognosticon based on Galen, then a section on the months of the year and their bearing on bloodletting, then the leechbook proper. The first sections deal with the head: (1) on how to make hair grow; (2) for headaches; (3) for insanity; (4) for epilepsy; (5) for eyes (an endless array of cures); (6) for the ears; and from then on a conglomeration without plan ending with treatments for scurvy and a chapter on the benefits and dangers of baths.

A satisfactory analysis of the diseases mentioned and of the treatment of them cannot be made by one without medical training. But even a casual list may be better than none and may give in a general way a notion of the practices of the time. And in an analysis we are again confronted with the difficulty of determining how much the translator understood and, further, how much the practitioners actually absorbed and applied. Numerous diseases are listed. But how far had diagnosis advanced? Are the names and treatments merely repeated parrot-like from the original? Some of these problems have already been attacked by Dr. Grön in his "Altnordische Heilkunde" and by Finnur Jonsson in "Laegekunsten i den Nordiske Oldtid." The new material in our manuscript will in all probability be useful to the medical historian in answering the above questions.

THE BRAIN AND MENTAL DISORDERS

Several simples serve to make a man's mind keener and to prevent forgetfulness. Thus mustard whets a man's wit (36r), camphor strengthens the wit (12v), the smell of insence (*thus*) aids the memory (36r), cloves are good against forgetfulness (18v). Mastix is good for mental troubles (21r); nutmeg harms the brain if used too frequently (23v). The leechbook gives the following treatment for madness:

> Item for madness, take the herb called peony and bind about the neck of the sick man; then he will grow better. Item if a man is witless take solsequium, salvia, and abrotanus; for three or four days give him these three herbs crushed in wine to drink. Item for an insane man, take the herb bronica [peonia?] and make a hole in it and hang it upon his neck; and let him drink of it [17r].

For phrenitis sorrel is prescribed (S.22v) and for hasty temperament celery, for "then the anger will ease and happiness increase." Fear is treated with Diasene, a compound medicine containing *sene*, i.e., senna, cassia: "It is particularly good for him who is afraid and full of anxiety or angry or hasty or who has some kind of insanity or disease of the heart." (45v). Peony cures nightmare (30r); and southernwood helps him who talks in his sleep.

Epilepsy is constantly grouped with insanity. It is treated with birthwort (7r), feverfew in honey (29r), peony bound around the neck (30r) and the smoke of mustard

(33r). The leechbook again gives a fuller account than the book of simples:

> Dioscorides says of the herb peony: I saw once a boy eight years old who had that herb hung about his neck. Then it so happened one day that the herb fell off three times. But at that very time the boy fell down in an epileptic fit. Then the herb was bound on him and immediately he grew well. . . . The same testimony Galen, the wisest of leeches, bore of that herb. [S17r-v].

Epilepsy and severe headaches are also treated with Diacastorium, an electuary made of beavers' kidneys (44v).

Lungs, Cough, Asthma

Diseases of the lungs are usually referred to by general terms (*lungnasott*, *lungnaverckur*) that will not allow specific identification. Garlic with honey is good for diseases of the lungs (*lungnasott*) (6r), fennel in wine helps lung trouble (*lungnasott*) (17v), Dyarondon Abbatis, an electuary, aids for pain of the lungs, (*lungnaverckur*) (43v), licorice "is good for cough and moistens man's blood in his chest, as well as the throat and lungs" (20r), nettles drive old cold from the lungs (36v). The antidotarium is the only section that clearly refers to pulmonary consumption. The general term *lungnasott* is used, but the further characterization of the disease and the Latin antecedent *ptisicis*, i.e. "for those having phthisis" makes the identification almost certain. The passage is: "Diapenidion an electuary is called. It is good for lung-trouble [*lungnasott*], for cough, for hoarseness which comes from excessive dryness, for asthma and for catarrh, and for man's wasting away [Latin: *ptisicis*]."

Asthma is frequently mentioned; it has the significant name *ongvi* "a narrowness, constriction." A few of the cures prescribed are southernwood (5r), birthwort (7r), plantain (5v), cummin (12r) and catnip.

Cough (*bosti*) is treated largely with the same simples as asthma or lung trouble. Besides those listed above might be added sweet-flag (15r) and elecampane with honey (16v). For the chest, lungs, cough, etc. the leechbook lists savory, horehound, southernwood, rue, salvia, myrrh, catkins.

Women's Diseases

Most frequent of all are the references to menstruation (*blodras*, *fluxum sanguinis*) and means for hastening it or for retarding an excess. Cabbage eaten green cleanses a flux (11v), crushed hemlock cleans the womb and hastens a flux (14v), hellebore applied externally has the same effect (17r), and iron-rust hinders and stops a flux and prevents conception (18r). Athanasia, a compound medicine, mixed with the juice of plantain stained with red hematite is good for women's flux (*fluxum sanguinis*). As already mentioned this passage is of special interest as an example of "red against red."

Childbirth is aided by seed of cabbage (*kal frio leysir barn fra konu* 11v), catnip (13v), mint (21r), and others. Afterbirth (*eptirburdur*) and dead fetus (*daut barn*, *fyrirfareth barnsefni*) are purged with birthwort (7r), dittany (15v), elecampane (16v), juniper (19r), cress (23v), rubia (in the original Latin undoubtedly madder, but here translated *bops* 31v), savine (35r), and the daisy (15v).

Fevers

Fevers of many kinds are listed and preventatives and cures in great number are given. The general term *rida*, covering any and all, is used frequently. Again we find specific mention of ague (*koldusott*), quotidian (*bversdagsrida*), tertian (*tbridiadagsrida*), and quartan, usually mentioned by its Latin name. Of cures we have first of all the list of charms and conjurations at the beginning of the volume. Some of these have already been quoted. Southernwood is good for ague (5r); cabbage boiled in old wine, crushed, and tempered with oil of roses resists a fever if the mixture is applied externally (11v); smoke of bitumen cures quotidian (9v); Electuarium de succo rosarum strengthens convalescents from tertian and quotidian fever (46v); water with plantain prevents quartan fever if drunk two hours before the fever is expected (5v); other cures for fevers are asafetida (8r), hellebore (16v), the ointments Populeon and Aragon (41v).

STOMACH, INTESTINES, ETC.

No part of the body is mentioned more frequently than the stomach (*magi, matmagi, stomachus*). Innumerable treatments are given to aid digestion, to purge a constipated or to bind a too loose stomach. References are very numerous to diarrhea (*utsott*, O.E. *utsiht*) and to dysentery (*blodsott*).

To strengthen the stomach and aid digestion are prescribed wormwood (4r), mugwort (5r), cinnamon (12r), cardamom (12r), cummin (13r), sweet-flag (14r), rocket (16r), and the compound gingiber conditum (48r), and others. For purgation are used aloes (7v), orach (8v), betony (10v), and a group of compound cathartics listed in the Antidotarium. To bind loose bowels, for diarrhea and dysentery, marshmallow (6v), dill (8r), cubeb (12v), juniper (19r), carrots (26v) are named.

For the entrails (*innyfli*) is prescribed saffron (12v); to heal swellings of, or pustules in, the entrails mastix is used (21r). Myrrh is good for pains in the side and for the entrails (22v). For bloated and puffed-up entrails ginger is used as a purgative (39v); so also is an electuary Dyaciminum, containing cummin as a palliative. The small intestines (*smatharmar*) and disease of them (*smatharmarverckur*) are treated with an electuary called Electuarium Ducis (the Latin used *ilii dolorem*).

LUMBAGO, SCIATICA

Lumbago (*lendaverckur*) is treated with southernwood boiled in butter (5r), carrots (26v), an oil made from mustard seed (32v), an ointment called Agrippa (41r). For sciatica (*larveckur*) one is to drink the juice of ox-tongue (9v) or the root of gentian (10r). Costus applied externally also helps (12v). Great mullein thins a too thick humor and is good for sciatica (14v).

BITES OF VIPERS, DOGS AND WILD BEASTS

Viper's bite (*hoggormsbit*) is treated with gentian (10r), salt and onion mixed (15r), meadow sweet in wine (22v). Onion crushed in honey or vinegar is good for dog's bite (*hundabit* 15r); mint crushed with salt helps if applied to the bite of a mad dog (21r). Fennel in wine is good for any poisonous bite (*eturbit* 17v) and celery is good for the bite of snakes and wild beasts (6r).

JAUNDICE

Some of the cures for jaundice (*gulusott*, i.e. "yellow sickness") are wormwood with celery (4v), garlic (6v) aloes (7v), daisy (15v) and burdock (20v).

The list given here does not pretend to completeness either in the enumeration of diseases or of cures prescribed. It aims merely to give a general impression of the knowledge of therapeutics of that day.

So far our point of contact with European medicine has been wholly with the School of Salerno. But our manuscript has also a contact with England not earlier noted by medical historians. This relationship is found in the four chapters on phlebotomy inserted in the middle of the book of simples. These chapters are related also to similar sections in the Stockholm manuscript of the Danish Harpestraeng[29] and in the leechbook A.M. 187,[30] for which the editors have found no sources, though Dr. Kristensen has pointed out certain suggestions of likeness to Constantine's "De Chirurgia."

Folio 26 of the Dublin manuscript gives first the proper times of the year for bloodletting: "Whenever there is need one shall let blood. But from the eighth ide [kalend!] of April to the kalends of June is best of all because then the blood increases in every living being." Then follow dangerous days when phlebotomy is to be avoided.

Next follows a discussion of seasons when for purgation drugs should be taken rather than bleeding resorted to.

Then comes an account of the principal veins and which should be cut for specific diseases. Specific directions are then given for the measure of blood to be drawn.

For this section I believe I have found the source in an amplified version of Bede's "De Phlebotomia" contained in an encyclopedic Latin manuscript (17 St. John's College, Oxford) written in England in 1110–1112. The short section on medicine has been published by Dr. Singer.[31] The chapters in the Dublin manuscript follow closely the text of this Latin manuscript in the very chapters which are not found in the standard edition of Bede.

Had our compiler used the common text of Bede we need not have supposed contact with English medical manuscripts, for Bede's work circulated throughout Europe and might easily have reached Scandinavia from the Continent; but use of a text corresponding in detail with the unique version of the Oxford manuscript makes it reasonable to suppose direct transmission.

To summarize, the importance of the Dublin manuscript is not, then, a revelation of new forms of medical practice or medical theory; it is rather that this manuscript enables us to see the progress of the dissemination of the Continental learning even in the remotest regions of the North and that it underscores once more the wonderful power and vitality of the School of Salerno. And, from the more specific Scandinavian standpoint, it reveals once more the close contact of the North with everything that was being done on the Continent. We have already in the literature of Iceland ample proof of the interest of the Icelander in the romance and story, in the theology and the metaphysics, in the travel and the adventures of the Continent, but the discovery of the Dublin manuscript gives us a fuller proof than we have yet had of how closely the Icelander followed also the scientific knowledge and its immediate application to the art of healing.

References

1. For a treatment of the same manuscript from a philological point of view see *Modern Philology*, Chicago, May, 1926.
2. For Denmark the work had been begun much earlier with the publication by Chr. Molbech of his edition of "Henrik Harpestraengs Danske Laegebog," Copenhagen, 1826.
3. General surveys are:
   Grön, F. Altnordische Heilkunde. *Janus*, 1908.
   Jonsson, F. Laegekunsten i den Nordiske Oldtid. Copenhagen, 1912.
   Of more specialized studies we have:
   Reichborn-Kjennerud, I. Laegeraadene i den eldre Edda. Kristiania, 1922.
   En oversigt over og karakteristik av de gamle nordiske laegeböker. Kristiania, 1924.
   Ormen i nordisk folkemedisin. Kristiania, 1924.
   Falk, H., Lid, N., and Reichborn-Kjennerud, I. Bidrag til norsk folkemedisin. Kristiania, 1921.
   Also many shorter articles in medical and pharmacological journals.
4. The manuscript is listed by Skulerud, O. Catalogue of Norse mss. in Edinburgh, Dublin, and Manchester, p. 47, no. 147, and has been briefly mentioned by Kristensen, M. Harpestraeng, p. xxvi, and by Haegstad, M. Kristiania Videnskapselskaps Forhandlinger, 1913, no. 8, pp. 3–4.
5. Larsen, H. Nok et Harpestraeng-Haandskrift. In *Danske Studier*, 1925, p. 177.
6. *Cf.* Bang, A. C. Norske Hexeformularer. Kristiania, 1901–2.
   Ohrt, F. Danmarks Trylleformler. Copenhagen, 1917.
   Kålund, K. Den Islandske Laegebog Cod. a.m. 434 a, 12 mo. Copenhagen, 1907.
7. All references will be made to folios in the manuscript. There are twenty-one folios (containing the leechbook and cookbook) which are incorrectly bound and numbered; these will be called the secondary series and references will be marked "S."
8. *Cf.* Kristensen, M. Harpestraeng. p. l ff. and p. 174 ff.
9. Kristensen, M. *Op. cit.* p. vi.
   Thorndike, L. The History of Magic and Experimental Science, i, 605 ff.
10. Kristensen, M. *Op. cit.* p. vi.
    Thorndike, L. *Op. cit.* i, 154 and 162 ff.
11. I realize the dangers involved in the use of this term. For an argument against it *cf.* Thorndike, L. *Op. cit.* i, 731.
12. Kristensen, M. *Op. cit.* p. x and xiv.
13. Kristensen, M. *Op. cit.* pp. i–v.
    Johnsson, J. W. S. Henricus Dacus: De Sim-

plicibus Medicinis Laxativis. Copenhagen, 1914.

14. *Cf.* note 2.
15. Kristensen, M. *Op. cit.* p. xi ff.
16. Haegstad, M. Gamalnorsk Fragment av Henrik Harpestreng. Kristiania, 1906.
17. Kålund, K. Alfraedi Islenzk. vol. i.
18. Kålund, K. Den islandske Laegebog, a.m. 434 a. Copenhagen, 1907.
19. Kristensen, M. Harpestraeng, has a helpful glossary of the herbs in the Danish version.
20. A study of herbs in medicinal use in Norway has been made by Reichborn-Kjennerud, I. Våre Folkemedisinske Laegeurter. Kristiania, 1922.
21. Cerefolium. The confusion of "c" and "t" and of "s" and "f" are common in this and other manuscripts of the period.
22. Best known is the reference in Tristram's Saga (ed. Kölbing, p. 78) to *trebakel, cf.* Engl. *treacle = theriac,* the most famous antidote of medieval medicine and one which survived in the apothecaries until our day.
23. I have used the edition printed by N. Jensen, Venice, 1471.
24. Wickersheimer. *Arch. f. Geschichte d. Med.,* v, 302 ff.
25. Sigerist, H. E. Studien und Texte zur früh mittelalterlichen Rezeptliteratur. Leipzig, 1923, p. 187.
26. For a list of manuscripts and printed editions of the "Antidotarium Nicolai, *cf.* Van den Berg, W. S. Eene Middelnederlandsche Vertaling van het Antidotarium Nicolai. Leiden, 1917, p. xix and xx.
27. A gap in manuscript.
28. Antidotarium Nicolai 1471: "Cum succo plantaginis propinata lientricis, discintericis, et ad diariam ualet."
29. Kristensen, M. *Op. cit.* p. 93 ff.
30. Såby, V. Det Arnamagnaeanske Håndskrift Nr. 187. Copenhagen, 1886, p. 90 f.
31. Singer, C. A Review of the Medical Literature of the Dark Ages with a New Text of about 1110. Oxford, 1917.

GRAPHIC SCIENTIFIC HISTORY

AS ILLUSTRATED BY THE HISTORY OF PHYSIOLOGY

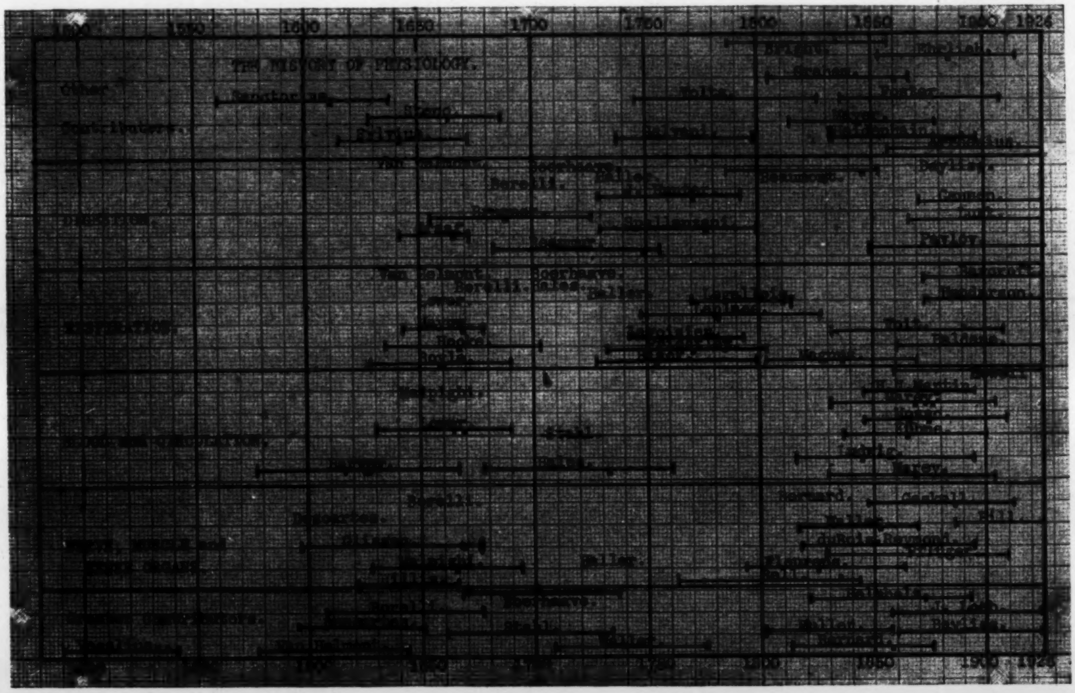
By OSCAR W. RICHARDS, M.A.

EUGENE, OREGON

THE objective graphic method is rarely used by the historian or by the student of the history of science. Yet most of scientific and medical history can be expressed to advantage by this method.

To illustrate this statement we may take, as an example, the history of physiology. Early physiological discovery may be conveniently summarized under five branches, namely: digestion, respiration, blood and circulation, neuromuscular system, and other studies. Certain physiologists contributed to several of these separate branches, which makes it desirable to group them together, under the caption of greater contributors.

The accompanying graph was made according to this method, using these six categories as horizontal rows of the graph. The time period comprises from 1480 to 1926, and is represented along the abscissa. The span of each man's life is indicated by a heavy black line with a short vertical cross line on each end of the main line. A short vertical line marks the date of the main contribution of each physiologist. The graph paper is green so that these india-ink life lines stand out in clear relief.



GRAPH ILLUSTRATING THE HISTORY OF PHYSIOLOGY.

Such an arrangement shows the relative progress in each branch of physiology at a given time, and the barren periods in its history. The sequence of discoveries may be easily followed; for instance, in respiration we find that Boyle made the first contribution in 1850, to be followed in order by Hooke and Mayow. In the case of one man contributing to several branches, his name and life line were placed with the greater physiologists, and his name without the line written at the proper places in the other branches.

The graph is only accurate to within two or three years in the life period. This sized graph shows most of the early physiologists, but is inadequate for the last hundred years. The original graph is about eight by ten inches. This lack of space could be remedied by using a vertically larger sheet. This chart and description is presented to suggest some of the possibilities of the graphic method of illustrating the history of science, and makes no claim to be complete. It was found to be very satisfactory in supplementing a seminar paper concerning the history of physiology.

[From Erastus: Varia Opusculum Medica. Frankfurt-a.-m., 1590.]

VISUALIZING MEDICAL HISTORY

THE PHYSIOLOGY OF RESPIRATION*

By HENRY SEWALL, M.D.

DENVER, COLORADO

THE President of the Colorado State Medical Society, Dr. Boyd, signalized his election to office by effecting an addition to the program for the annual meeting which must give it permanent distinction in the records. He has harbored the lofty ambition to have portrayed by means tangible to vision and to touch, as far as may be, the History of Medicine.

To the present writer was assigned the task of representing in some way the progress of Physiology. The allotment was accepted in the spirit with which we confront the impossible: the whole cannot be done, therefore its smallest fraction assumes a relative importance in the calculus.

On reflection an idea was conceived, and grew apace, that real help both in the learning and teaching of history could be gained by coördinating the concepts of time and space in an objective picture. This would provide the study of history with somewhat the same sort of aid that chemistry, physics or biology finds in its practical demonstrations.

It was determined to construct a chart representing historical time on which should be allocated the names and life tenures of the makers of a certain branch of science. It seemed obvious that such visual localization of men must not only greatly assist the memory in recalling their place in history but accentuate the relation of man to man and to the development of knowledge. No argument should be needed for allying any visual device to historical representation.

The cinema has amply demonstrated its popular appeal in the field of portraiture. My own idea has been to stimulate unused association centers in the brain through which new interest and new meaning might be thrown around important persons and events of the past.

My task has been frankly pedagogical in design, and its progress convinced me that the scheme furnishes a method by which the student might profitably record the evolution of his chosen science.

Somewhat similar devices have been employed before, but no apology need be offered for another attempt to lure the interest of readers to the treasury of history from which have been drawn the funds for our present buildings. This knowledge is a key to understanding. Its discipline exercises the finest powers of mind and feeling.

In trying out the purpose under discussion my venture was restricted to the history of a single field of animal physiology, that of Respiration. I am indebted to Dr. H. J. Corper for preliminary trials of the chart idea, and especially to Dr. Sanford Withers, who has devoted his skill to the preparation of the chart itself.

The calendar of our chart is represented in the column on the left. It will be noted that of one hundred and five biographical names recorded only eleven are included within the first twenty centuries; therefore but small space is allotted to each of these periods. But from the sixteenth to the nineteenth century, inclusive, ample space is given to the division of each century into decades.

The family name of each personage, and under it the date of his birth and death, are recorded within a rectangle which covers two decades on the chart, and is placed at about the middle of his career. From the middle of the lower side of each rectangle a line is drawn below to a point representing the date of birth of the individual; similarly, from the upper side, above to a point corresponding to the date of his death. The time of birth determines the order of our biographical index, the names following in that relation from left to right and from below upward. Decedents in the twentieth century have their life lines terminated at the beginning of that epoch, or the brackets round their names impinge directly upon it.

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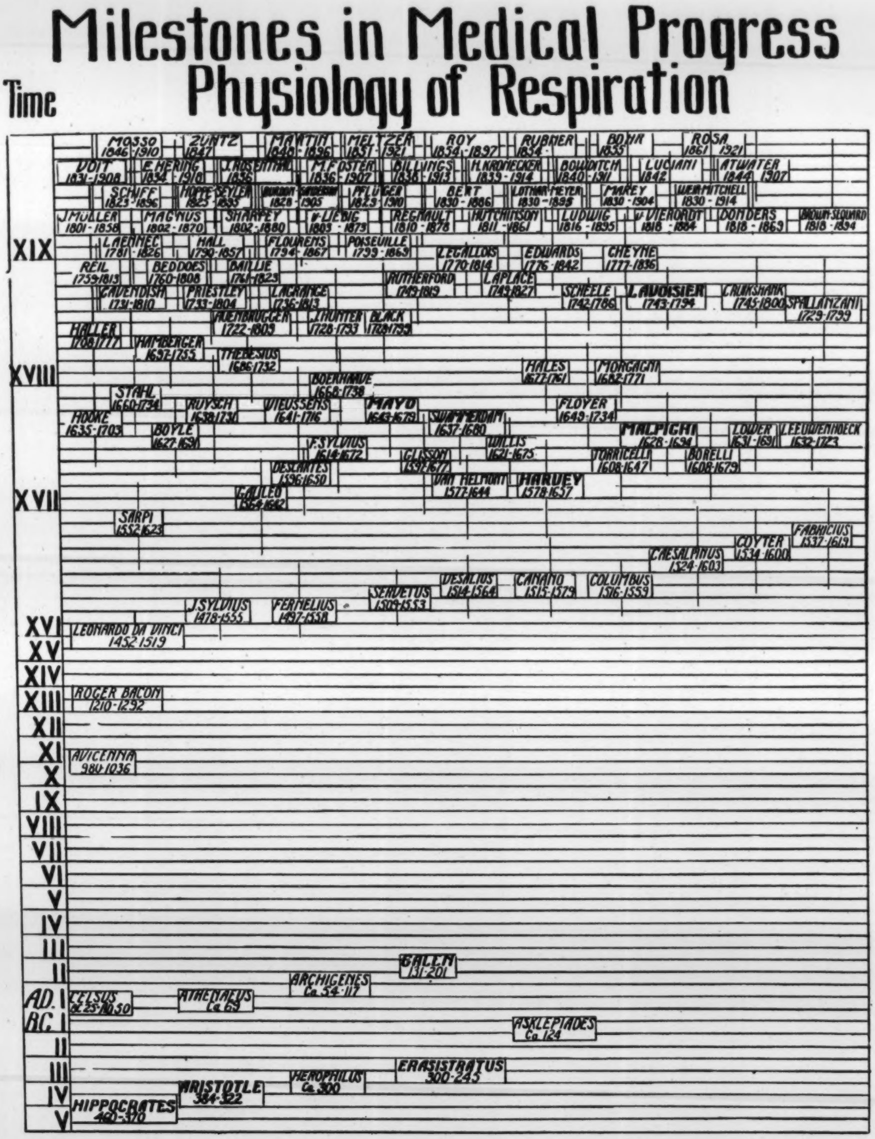
* Read before the San Diego County Medical Society, Jan. 5, 1926.



In five cases it was impossible to learn the dates of death in time for this review. I trust I have not prematurely buried any of my subjects.

A glance at the chart shows who were contemporaries, as well as the temporal sequence of individuals. An attempt has been made to indciate by heavier lettering one's estimate of the predominant characters in the development of science.

It was designed at the outset to append a legend to each name, setting forth the accomplishments of the person. This proved impracticable, and it is advised that biographical data be preserved in a card index which, for teaching purposes, should form an important adjunct to the chart. It is obvious that overcrowding of names in the late centuries could be avoided by broadening the diagram. Possibly the chart should have been given the form of a triangle with base above.

Genealogical tables begin at the top and are read downwards. First-class authority has advised that procedure here. But I prefer to typify the development of knowledge as upward, like a tree. Again, economy of space might have been secured by omitting the blank period of the Dark Ages, but we should have thus lost the contrast with other times.

If this chart awakens any interest, such will probably be manifested by attention directed to its omissions and derelictions. Medical history and tradition cover some five thousand years antedating the Christian Era. Hippocrates could not have sprung full-panoplied from chaos. We want to know the soil and the cultivation which made him possible. Through timely good fortune Dr. W. A. Jayne, of Denver, has just given us an account of the religio-medical lore as culled from the earliest times.[1]

When in earliest ancient Greece a man greatly distinguished himself in any field he was likely to be, as it were, canonized after his death and raised to the rank of a demigod and patron of the particular activities in which he had been adept. Such was Asklepios, first mentioned by Homer in the Iliad as a "blameless physician."

So famous became the cures of intractable diseases effected by his votaries that various healing shrines, or Asklepieia, became established throughout Greece, which were thronged by patients.

"Only the pure were permitted to approach the god, and on entering the *hieron* all were obliged to undergo purification." This usually consisted of a cold bath, perhaps with salt, or they were treated with incense and fumigations, and a rigorous diet or fasting was imposed. Among the most impressive surroundings the votary was permitted to approach the statue of the god and offer sacrifice with prayers, and even touch his diseased member to the hand of the image.

As evening approached the final preparations were made for the elaborate and final course of treatment by incubation. Dressed in white, the patient was assigned a pallet after placing sacrifices on the altar. The white-robed priest offered an impressive prayer and the patient was enjoined to sleep and fear nothing. In early morning the priests, one of them in the costume of the god, returned bringing ointment to anoint the sick body, and sacred serpents, which crept over the sleepers and were supposed to whisper the remedy in the ear and sometimes to nip it.

"The experience of the night, acting on an overheated imagination, the assumed appearance of the deity, possibly in the form of a serpent, and the application of the hand of the god—all in the dim light while in a state midway between sleeping and waking—were readily interpretated as a divine visitation, a celestial dream or vision." Thus the injunction to faith was crystallized in a belief so strong that it is no wonder that most disorders might be expected to receive amelioration by induction of a placid state of mind, and the functional troubles be cured by suggestion. Such, in general, was the method of application of priest-medicine in all ancient countries. It would be a grave error to assume that this therapeusis was guided by conscious deceit. It was simply ingeniously devised to get results.

It is a far cry from the times of treatment of disease by incubation to the operations of modern cults of similar inspiration, but it may well be doubted whether the modern methods are as effective as were the ancient ones.

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[1] Jayne, W. A. The Healing Gods of Ancient Civilizations. New Haven, 1925.

In the unproductive centuries following Galen it would be interesting to depict how the germ of Greek Medicine was preserved by the long line of Arabian and other scholars who marked time in the march of knowledge through the Dark Ages. It would be desirable to apply the graphic method to the influence of the Church and of the Universities to the development of our knowledge.

Adverse criticism could be fairly opposed to my choice of portraits for our gallery of fame. Such comment, based on research, would itself be high reward. It has been my effort not to pad this catalogue but still to escape convention in notation, not only of those who have produced knowledge in our chosen field but of those who have preserved it or have inseminated other minds and inspired research.

Thus Johannes Müller (1801–1858) opened the modern epoch in physiology through the genius of his intellectual children. Though we cannot ascribe to Johannes Müller any single discovery of paramount importance, two things conspired to make him a salient figure in physiological history. First, he must have been a most attractive and inspiring personality; second, his power of imparting information and of arousing scientific ideals must have been phenomenal. His general textbook on physiology was the first great modern treatise on the subject and for years remained its authoritative handbook.

No less important than the character of the man was the special stage in scientific intellectual evolution at which he entered. The time was ripe; the minds of men were seething. Not otherwise can we explain that from among his pupils there emerged Virchow, the pathologist; Brücke and Wagner, physiologists; Helmholtz and Du Bois Reymond, physiologists, physicists, mathematicians; and such other masters of biological science as Claparede, Ludwig, Schwann, Volkmann, Reichert, Lachmann, Vierordt, Trochel, Kölliker, Remak, Lieberkühn and Haeckel.

"At his death Müller's chair was split into three, Du Bois Reymond took physiology, Virchow took pathological anatomy and Reichert took morphology."

Carl Ludwig (1816–1895) must have reflected some of the best characteristics of his master, Müller. His was a gentle, serious, but withal humorous soul. There seemed to be no vanity or selfishness in him. During his years as professor of physiology at Leipzig earnest students of research flocked to him from all over the world to the number, it is said, of more than three hundred. When they had no preconceived task he assigned them a subject of research and very often personally performed for or with them the experiments which often led to discoveries of permanent value. The publications detailing such work rarely contained Ludwig's name or, if so, only as joint author.

It was my privilege to be admitted to his laboratory for the winter of 1879 when he was sixty-three. In the idle moments just before his evening lecture preceding supper he would likely come by my table and say, in German, "Now tell us a joke." One evening after the lecture the professor was intently engaged in a dissection of the carotid region in a dead dog. After a while I ventured to ask what he was about. He said that in the morning's experiment he had noted milky chyle in the lymphatic of the carotid sheath and he was trying to discover how the chyle from the abdominal lacteals could have reached the neck. Here was the old man patiently plugging away after the fatigues of a busy day in order to clear up a new fact which would not wait for solution. The young man looked on for many minutes and then went to his supper. But the old man must have stuck to his job, for in the morning, when I asked him his results, he said: "I found a collateral circulation between the thoracic duct and the cervical lymphatics." It set me to thinking, perhaps it was this sort of thing that made Ludwig preeminent.

Sharpey (1802–1880) preserved the spirit of biological research in England in his time and taught Michael Foster (1836–1907) and Burdon Sanderson (1828–1905).

Foster founded the School of Physiology at Cambridge and helped breed Martin, Gaskell, Dew-Smith and Lea, to name only the dead, including Langley who left us but a few weeks ago; and, through Martin (1848–1896) he gave the first great general impulse to physiology in America. Burdon Sanderson fathered physiology at Oxford.

Boerhaave was the Roman Centurion of his time. Roger Bacon first struck the keynote in the march of Experimental Science after a thousand years of imitation and speculation.

Even a superficial glance at our chart presents elements of interest. Beginning at the bottom we note that for the first seven hundred years of history the outstanding figures of medicine were essentially all Greek. Even so, following the Golden Age of Art, Science and Philosophy there was a lapse of some four centuries before the advent of Galen, the prototype of the modern investigating but imperiously self-confident "successful practitioner" of medicine.

Then followed a barren period of some fourteen centuries wherein the truths and errors of Galen continued to dominate thought and in which the data of knowledge were transcribed by Arabian, Persian and Jewish physicians.

It may be good for the soul to dwell upon the masters of this Golden Age of Greece. They included the incomparable Phidias, sculptor; Hippocrates, sage of medicine; Euripides, Aeschylus and Aristophanes, poets; Socrates and Plato, philosophers; Aristotle, the chief and leader in every branch of contemporary knowledge. Sir Francis Galton, founder of the science of eugenics, in his "Hereditary Genius,"[2] made interesting comparisons between the intellectual planes of the ordinary Athenians of those days and of the average Englishmen of his own day. Galton had found, as I remember, that in English history there was a certain small number of men with minds of very first rank per million of population. Looking back to Athens in the palmy days of Greece he found that the ratio of very great men to the population of Athens was very much higher. He concludes that these intellectual mountains must have been planted on a high plateau. He deduces, accordingly, that the intellectual ability of the average Athenian of that day was as much higher than that of the Englishman of his day as was the ability of the English above that of the aboriginal African savage.

In the ten centuries following Galen, comprising the Dark Ages, my judgment gives place only to the Persian, Avicenna (980–1036).

Suddenly the sixteenth century blooms with a galaxy of medical investigators or feeders of medical thought. Of eleven personages listed no less than seven were Italians and nearly all were contemporaries.

It is curious to observe that, including Leonardo, all of our eleven heroes were anatomists whose studies of the heart and blood vessels gave the soundest possible basis for the subsequent perception of function. And I will assume that an intelligent conception of the respiration must begin with a study of the circulation as it ends in that of metabolism.

Contemplating the medical masters of this era it must be a dull student who would not get delight in turning the leaves of Choulant's reproduction of their drawings.[3]

Vesalius, the "Father of Anatomy," is said to have been inspired by Leonardo da Vinci. At a time when any conflict with authority always adumbrated the Stake, Vesalius' was the first masterful spirit which dared throw contempt on teachings of Galen that had ruled minds for fourteen centuries. Leonardo da Vinci was himself so universal a genius that we are likely to over-look his special contributions to physiology. He apparently preceded Boyle by a century and a half in the experimental demonstration that pure air was necessary both to burning flames and to animal life: he says: "Where flame cannot live no animal that breathes can sustain existence."

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[2] Galton, F. Hereditary Genius, etc. New and revised ed. with an American preface. N. Y., 1871.

[3] Choulant, L. History and Bibliography of Anatomic Illustration. Trans. by Mortimer Frank, Chicago, 1920.

Allbutt[4] says of him: "The student of his exquisite drawings cannot but think that Leonardo, with his prodigious imagination and mastery of hydraulics, must have discovered the circulation of the blood, but in his manifold and various interests failed to proclaim it. He suggested that the blood might return from the lungs to the heart in expiration."

It is inspiring to realize that the human mind and body can reach the heights scaled by him. He lives in fame as a painter, an architect, a sculptor, a scientist, an engineer, a mechanician, a musician. You know his painting of the Last Supper; perhaps you have seen his Mona Lisa.

The reader of Luciani's work on "Human Physiology,"[5] will find there recorded the evidence on which Italy claims Caesalpinus, with certain countrymen, as the discoverer of the circulation of the blood.

We shall find that the story of discovery of the circulation of the blood leading to Harvey (1578–1657) took a century in the writing. Beginning with Servetus (1509–1553), who was burned at the stake through the machinations of the bigot, John Calvin, we find light beginning to shine upon the physiological darkness.[6] Galen himself is said to have hit upon much of its truth.

There was a general conception among the ancients that the blood somehow got from the right to the left ventricle; but their erroneous ideas as to the function of the respiration blinded them to the importance of the lungs to the circulation. They thought that the passage of blood from one ventricle to the other was by seepage through invisible pores in the interventricular septum.

A passage in a work by Servetus denies the patency of the septum and asserts that the blood passes from the right ventricle into the pulmonary artery, whence it transudes into the pulmonary veins.

Some six years later Columbus (1516–1559) reached more or less independently the same conclusions, realized more completely than Servetus its great importance and claimed priority of discovery. But the Italians have a stronger claim for the discoverer of the circulation in Andreas Caesalpinus (1524–1603) who published a work in 1571, forty-five years before Harvey began his public lectures and fifty-seven years before he published his discovery, in which he, Caesalpinus, "assumes a constant and physiological transit of the blood from the arteries to the veins, through the anastomosis, which he termed the 'vasa in capillamenta resoluta,' to every part of the body; this perpetual forward movement of the blood from the venae cavae to the right heart, thence to the lungs, from the lungs to the left heart and from the left heart to the arteries was termed by him 'Circulatio.' "[7]

But, as Robert Willis points out, though Caesalpinus used the right words in his description, the right ideas were given them by others a century after him. For he still speaks of the permeation of the ventricular septum by the blood; and he still refers to the flux and reflux of the blood in the veins in a tide-like manner. Apparently he did not really grasp the idea of a continuous blood circuit, any more than Fabricius (1537–1619), who finding that all veins connecting with the venae cavae have valves, grasped the main function of these. The credit for guessing that the purpose of the valves is to keep up a venous current in one direction only is given to Sarpi (1552–1623); some authors even credit Sarpi with discovering the general circulation.

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[4] Allbutt, Sir T. C. Greek Medicine in Rome., etc. N. Y., 1921, p. 317, footnote.

[5] Luciani, L. Human Physiology. Trans. by Welby, N. Y., 1911–1921, I, 157.

[6] Osler, Sir W. Michael Servetus. *Bull. Johns Hopkins Hosp.*, Balt., 1910, XXI, I.

[7] Luciani, L. *Op. cit.*, I, 163.

Robert Willis, in his Life of Harvey prefacing his Works in the Sydenham Library, submitted the Italian claims to searching criticism and declared: "The world saw nothing of the circulation of the blood in Servetus, Columbus, Caesalpinus, or Shakespeare, until William Harvey had taught and written." A modern physiologist, the late John G. Curtis, in a scholarly monograph, has dissected Harvey's mentality as represented in his experiments and dialectic.[8]

The reader of the evidence cannot but grant that for a hundred years before Harvey the darkness had been lighted now and then by flashes of inspiration. The image of the truth stood out plainly enough but its meaning was not perceived. Its conception was not grasped, and consequently was not pursued. Not until Harvey applied the inductive method with the tool of experimentation was the truth grasped, and even then more than a generation elapsed before Malpighi (1628–1694) completed the proof of the blood circuit by discovery of the capillary circulation.

Harvey graduated in Arts after three years at Cambridge. He then, at the age of nineteen, chose the great University at Padua for his medical course, where he studied five years and obtained his licentiate. Among several able instructors at Padua, Harvey appears to have been especially indebted to the famous anatomist, Fabricius ab Aquapendente. The latter studied intensively the valves in the veins. He believed their function to be to prevent undue congestions of blood in the periphery, to strengthen the veins and to prevent their overdistention; all fundamental properties, but he failed to see their relation to the afferent blood current of which his great pupil was to make such trenchant use. Harvey returned to England the year of his graduation (1602) and within two years began the practice of his profession in London.

We cannot doubt that, even as an undergraduate, Harvey's mind must have been saturated with the doctrines of the circulation as then conceived. His was the ready mind to apprehend the truth, and his the genius, as so well exemplified later in Lavoisier and Pasteur, to realize that but one, the experimental, method was capable of defining the boundary between truth and error.

It was not until 1616, in his thirty-eighth year, that he began those public lectures in which he unfolded his theory of the circulation of the blood. "It was in 1628, the year of his fiftieth birthday that Harvey published, at Frankfort on the Main, his famous Latin treatise entitled 'An Anatomical Exercise on the Motion of the Heart and Blood in Animals.'"[9] Thus, not until fourteen years after graduating in medicine did he begin to teach in public and not until twelve years after this and twenty-six years after graduation did he publish his doctrine. But this by no means completed his work. It is interesting, indeed, that after clearing the way for a full comprehension of the physiology of respiration, Harvey still remained subject to the Aristotelian doctrine that the main purpose of respiration was to cool the innate heat of the body. But in later life his clear mind lost confidence in this belief, but offered no substitute; as to respiration he concludes: "Surely a more knotty subject could hardly be found."[9]

Harvey's failure to advance a theory of respiration on insufficient evidence was a worthy and hardly inferior counterpart of his positive exploits.

A good deal of sociologic interest attaches to the fact that Harvey won distinguished success as a practicing physician during the years of his experimental work and his public exposition of its results in lectures. He was appointed personal physician and attendant upon the King, Charles I, and probably drew his clientele from the highest and most remunerative social circles.

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[8] Curtis, J. G. Harvey's Views on the Use of the Circulation of the Blood, etc. N. Y., 1915.

[9] Curtis, J. G. *Op. cit.*

But upon the publication of his work on the circulation in 1628, at the age of fifty, there seems to have been a sudden falling off in his practice, so jolting and so immediate that the two events would appear to bear the relation of cause and effect. This may start disquieting reflections in the minds of younger workers today; but they may confidently entertain the assurance that, in our times, early publication of the right kind of stuff is the most certain and efficient and ethical instrument with which to open that oyster, the world. Indeed, the provisions for the endowment of research have been so generous within the past decade or more that that great truthteller, T. H. Huxley, if alive today, would not venture to repeat his declaration of the early seventies, when in advising students as to the choice of a career, he said in effect: "It would be better for the material welfare of a young man without affluence that he should be a drunkard than that he should become a victim to the divine dipsomania of original research."

We now enter an era in which the fundamental chemical facts underlying respiration, which Harvey had lacked, began to be unfolded.

At the time when Harvey had probably essentially completed his theory of the circulation, one of his contemporaries made the first distinct contribution to the chemistry of the respiration. This was a curious medical genius, the Belgian, Van Helmont (1577–1644). He was founder of the so-called Iatrochemical School, which, with its congener the Iatromathematical or Iatrophysical School, would form a trenchant examination theme for the undergraduate student of medical history. Van Helmont more or less vaguely identified carbonic acid, calling it "gas sylvestre," though it was left for Black, one hundred and fifty years later, to accurately isolate it and describe its vital relations.

It was nearly two hundred years after Van Helmont that Lavoisier demonstrated the essential nature of the respiratory function:

> Jean Baptiste Van Helmont was the noblest of the experimental alchemists, precursor of Priestley and Lavoisier, the founders of modern chemistry. He found that on burning coal and in the fermentation of wine, a gas which he called *gas sylvestre* escaped, which was incapable of maintaining a flame and produced asphyxia and death in mammals. This gas may develop in the heart of the earth, as in the Grotto del Cane near Naples; it bubbles up in certain mineral waters, and could be evolved from the calcareous concrements found in the crab's stomach by dissolving them in vinegar.[10]

It is interesting to note that Van Helmont coined the word "gas," from what etymology is not clear.

The seventeenth century is marked by the activities of a collection of astounding intellects. Fortunately research took the road of the physical sciences. We have seen that the impulse to chemical study on modern lines was given by Van Helmont.

With Galileo (1564–1642), and following him, mathematics and physics were developed to a high plane. Galileo strongly influenced the intellects of his contemporaries. Fascinated and enthused with their observations and experiments in inorganic nature, the thinkers of those days were fain to explain the phenomena of life itself as the expression of the laws of physics and chemistry operating within a peculiar environment, the organized body, thus anticipating our most modern doctrine. After the manner of the ancients, the viewpoints of students were represented by different schools of thought. Thus we have the Iatrochemical School, fathered by Van Helmont. *Iatros* in Greek means "physician." The tenets of the school sought to explain vital phenomena as the expression of purely chemical forces.

The chemical viewpoint outlasted the cult in which it arose and was later the source of great contributions from Willis (1621–1675), Lower (1631–1691), Mayow (1643–1679), Black (1728–1799), Cavendish (1731–1810), Priestley (1733–1804), Scheele (1742–1786) and Lavoisier (1743–1794).

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[10] Luciani, L. *Op. cit.*, I, 371.

On the other hand the mathematicians and physicists, whose first experimental exponent was Borelli (1608–1679), founded the Iatromathematical School and explained vital phenomena as due to purely physical forces.

Thus Borelli discovered the fact that muscles do their work by becoming thicker and shorter; and his observations and reasoning on the continuous movement of the systemic circulation impelled by the periodic heartbeat reads almost like a modern contribution. The word Physiology, which had been rarely employed in earlier times, "was now coming into general use as a part of physics, 'and this he proposes (in his book)' to ornament and enrich by mathematical demonstrations."[11]

Anticipating Borelli, but a contemporary of his, the great thinker Descartes, who was not an experimental physiologist, wrote extensively on the thesis that the animal body was a pure mechanism for expressing the dictates of the in-dwelling soul.

Foster says of him:

> It was part of his philosophy to show that man consisted of an earthly machine inhabited and governed by a rational soul. . . . He wrote a treatise which stands out as the first textbook of Physiology, written after the modern fashion, though in a popular way. We may perhaps speak of him as the Herbert Spencer of the age in so far that his treatise on man bore somewhat the same relation to the physiological inquiries of the time as the Principles of Biology to the biological researches of the present day.[12]

Allbutt[13] gives a high place in the development of physiology to Thomas Willis. He says: "It was Willis who made the return to bio-chemistry, and he first, and soon after his pupil Lower, produced the change of color in the blood experimentally, admitting and excluding air." He introduced iatrochemistry or biochemistry into England. Both Willis and Lower were popular and exceedingly successful practicing physicians. But the former comes under the trenchant criticism of Michael Foster who stigmatizes him as primarily a money-getter, an imitator and copyist of phrases who cared more for fame than for the truths of Nature. Foster suspects that the great classic of Willis, his book on the brain, was rather the work of his assistant, Lower, than his own. Says Foster: "Lower . . . was a real man of science, with a clear penetrating mind, with a genuine love of truth for truth's sake, a worthy mate of Boyle, of Hooke and of Mayow." But it remains for us to criticize the critics. Human judgments are largely determined by the psychology, the experience and the inherent motives of the judge. Michael Foster was a man of science pure and simple. He despised the foible of vanity and had no patience with mercenary inclinations. Clifford Allbutt was, too, a scholar of high rank and a humanitarian of pure ideals. But he was also a practical physician, familiar with the seamy side of life and with a perception that sordid motives tend to mingle with the purest human activities. He knew, as we know, many admirable intellects, most useful to science and society but tainted with despicable characteristics, and it is but the broadest and highest expression of justice to separate the true metal from the dross.

Thomas Willis had at least that sensitive perception of truth, which we now and then witness in a clinical confrere, that leads to right action as if by intuition. Moreover, Willis seems to have had extraordinary power of influencing others to do their best work and thus multiply his own best powers.

Not to dwell too long on this side issue, it is worth noting that everywhere and always critical judgment is colored by the environment of the critic. Talk of medical education with the man of the laboratory and you will get one point of view; talk with the practical clinician and you will get another. We must often fall back in our conclusions on the abstract fact that truth is one and indivisible. We must realize with the billiard player that every slightest impulse given the ball effects its progress and that its final destination is determined by exact mathematics.

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[11] Luciani, L. *Op. cit.*

[12] Foster, Sir M. History of Physiology. Cambridge, 1901, p. 58.

[13] Allbutt, T. C. *Op. cit.*

One of the most significant features of this richly fruitful period is found in the type and training of the men who developed its biological science. Garrison writes of it: "Thus the development of the physiology of respiration, from Borelli to Magnus, was almost exclusively the work of three mathematicians, two physicians and five chemists."[14]

We must now turn for a moment to the physiological conception of the Greeks. From Aristotle to, but not including, John Mayow we find speculation dominating the interpretation of natural phenomena.

The ancients completely misunderstood the purpose of the respiration. They never dreamed that it was the agent of combustion in the body but supposed it to be a safety, cooling device to prevent overheating of the organism through its inherent fire. This misconception led them into a blind alley which received no outer light until the time of John Mayow and from which thought did not emerge until led by Lavoisier. But this period of history must be barren for us unless we can assume the viewpoint of the great minds of those days.

To the early investigators two things above all must have stigmatized higher living beings: one was animal heat; the other was vitality itself. What more natural, then, than to conceive that fierce combustion was a sign of mammalian life and that the turbulent heart was the seat thereof? And it was altogether reasonable to suppose that such a furnace should have a damper; and what more obvious than that the cool air entering the lungs through the respiratory motion should prevent the fires within the heart from consuming the body? We find, accordingly, that for twenty centuries, including at the end even Harvey himself, the function of respiration was completely misunderstood; it played a rôle to fit the hypothesis of the origin of animal heat.

What a masterly conception was the *pneuma* of Galen, modified from his predecessors', entering the lungs with the air, reaching the heart through the pulmonary veins, generating animal spirits which, transported by the blood, vivified the body; and the "fuliginous vapors" generated by combustion could escape in the air of expiration! Thus the soul and vitality were given a physical basis, perhaps as comprehensible to a layman as our ether and electron. Indeed, to a man from Mars the ponderable electricity and riotous ether of today might appear of the same intellectual order as *pneuma*.[15]

To quote again from Garrison[16]:

> "Before Harvey's time," says Allbutt, "respiration was regarded not as a means of combustion but of refrigeration. How man became such a fiery dragon was the puzzle!" Harvey's demonstrations showed that the blood is changed from venous to arterial in the lungs, but beyond that point, as even Pepys has recorded in his Diary, no one could tell how or why we breathe. The successive steps in what Sir Clifford Allbutt calls the "pathetic quest for oxygen" were as follows: First, the distinguished chemist Robert Boyle made experiments with flames and animals *in vacuo* (1660), demonstrating that air is necessary for life as well as for combustion. Next, Robert Hooke . . . in 1667, showed, by blowing a bellows briskly over the open thorax of a dog, that artificial respiration can keep the animal alive without any movement of either chest or lungs. This experiment, which had also been performed by Vesalius, proved that the essential feature of respiration is not in its intrinsic movements, but in certain blood changes in the lungs. The next step was made by Richard Lower, of Cornwall . . . an able physiologist and successful practitioner, who was first to perform direct transfusion of blood from one animal to another (February, 1665), and who, with Schneider, overthrew the old Galenic idea (even upheld

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[14] Garrison, F. H. History of Medicine, Ed. 3, Phila., 1921.

[15] Allbutt, T. C. *Op. cit.* Chapter on Pneumatism, p. 224.

[16] Garrison, F. H. *Op. cit.*

> by Vesalius) that the nasal secretions originate in the pituitary body. . . . About 1669 Lower injected dark venous blood into the insufflated lungs, and concluded that its consequent bright color was due to the fact that it had absorbed some of the air passing through the lungs.
>
> Finally, John Mayow . . . another Cornishman, demonstrated, in a series of convincing experiments, that the dark venous blood is changed to bright red by taking up a certain ingredient in the air which, as being a constituent of nitre (KNO_3), he termed the igneo-aërial particles or nitro-aërial spirit of air.

Under this unfortunate appellation Mayow clearly distinguished the properties of oxgyen.

A more pertinent illustration of the fruitfulness of the inductive method in science could not be found than in this modern history of respiration. But just as Van Helmont's "gas sylvestre" had long to wait before Black rediscovered "fixed air," carbon dioxide, so Mayow's conception was born too soon.

More than a hundred years elapsed before Priestley isolated oxygen and identified its properties but, in a most interesting way, failed to comprehend its relations to combustion and respiration because his imagination was enthralled by the phlogiston theory of chemistry which had been enunciated by Stahl a hundred years before. With all the speculative ardor but without the genius of the Greeks, it is curious how Stahl, with a hypothesis borrowed from the now obscure Beccher, should have so long influenced the philosophy of physiology and chemistry.

History, like current society, is often ruled by perverted minds of dominating force. It is hard even today to grasp the viewpoint of the phlogiston theory. If my little essay here can induce others to read Foster's satisfying account, it will be well rewarded; they will then want to browse round the well-spring set flowing by Garrison, and they may let Allbutt take them by the hand and introduce them to his friends, the masters of medicine of Greece and Rome. I cannot in this brief sketch venture to play the expositor or critic of the phlogiston theory. It seems to me, perhaps erroneously, to foreshadow the modern conception of zymogen, the inactive principle from which the active ferment of secretory glands is developed.

Thus, Foster quotes the chemist F. Sylvius (*ca.* 1660): "Briefly, in the act of composition, as an instrument there intervenes and is most potent, fire, flaming, fervid, hot; but in the very substance of the compound there intervenes, as an ingredient, as it is commonly called, as a material principle of fire, not fire itself. This I was the first to call 'phlogiston.'" It would have been rare humor to have called it "perspicuity"!

Foster thus writes:[17]

> Priestley, as I have said, was devoted to the phlogiston theory. He thought phlogiston, he could not lay hold of any subject save from the phlogiston point of view. Air supported combustion because it took up the phlogiston given out by the burning body. Common air was to a certain extent free from phlogiston, it was dephlogisticated, and in proportion as it was so dephlogisticated, it could support combustion.
>
> Common air supported combustion to a certain extent only, a part only of it could support combustion because it was only partially dephlogisticated. The new air (oxygen) which he got from the metallic oxides was wholly dephlogisticated.

Briefly, according to the phlogiston theory, combustion was a concomitant of chemical decomposition and not, as we know it, of chemical combination.

It is an interesting illustration of the superiority of Science to narrow nationalism to find the Englishman, Foster, volunteer this tribute: "Whether Lavoisier got at his result wholly of himself or no, he and he alone, not Priestley in any way, got at the true meaning of the result. He and he alone really discovered Oxygen."

From his most fortunate association in research with the great mathematician

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[17] Foster, M. *Op. cit.*, p. 168.

Laplace, Lavoisier with him developed the following conclusion:

> Respiration is therefore a combustion, slow it is true, but otherwise perfectly similar to the combustion of charcoal. It takes place in the interior of the lung without giving rise to sensible light because the matter of the fire (the caloric) as soon as it is set free is forthwith absorbed by the humidity of these organs. The heat developed by this combustion is communicated to the blood which is traversing the lungs, and from the lungs is distributed over the whole animal system.

The great Lavoisier, possibly overpersuaded by his physiological associate Sequin, had limited the site of animal combustion to the bronchial tubes, the assumed fuel being carbonaceous matter excreted therein.

Curiously enough, another great French mathematician beside Laplace here entered the physiological quest and diverted it into the right path. Lagrange (1736–1813), assisted by a skilled chemist, Hassenfratz, reasoned that were the lungs the sole seat of the generation of bodily heat, as postulated by Lavoisier, not only should the lungs be manifestly warmer than the rest of the body but they would likely be consumed by combustion. Lagrange (1791) accordingly advanced the idea that the blood passing through the lungs absorbed the oxygen of the inspired air and in the course of its circulation through the body the dissolved oxygen combined little by little with the carbon and the hydrogen of the blood, warming the body and forming carbonic acid and water to be returned in the venous circulation to the lungs and there excreted with the expired air.

But the great error of Lavoisier and the lesser one of Lagrange were both exploded by Spallanzani's demonstration of tissue respiration.

The Abbé Spallanzani (1729–1799), who had already spent many years in the most convincing experimental development of our knowledge of digestion, devoted much of his latter life to the study of the physiology of the respiration in animals both vertebrate and invertebrate. Foster says of him[18]:

> In addition to many valuable observations as to the effects of circumstances and environment, such as temperature, hibernation and the like on the respiratory process, these memoirs (published in 1803, after the death of Spallanzani) contain two far reaching conclusions. The one is that the tissues, like the body as a whole, respire, that is to say consume oxygen and produce carbonic acid; the other is that animals (snails) placed in an atmosphere of hydrogen or nitrogen give out carbonic acid in the same way that they do in common air.

But history here repeats itself. Human minds could not clearly grasp Spallanzani's conception, even when W. T. Edwards, as late as 1823, published his extraordinary essay, "The Influence of Physical Agents on Life," setting forth essentially the modern doctrine. Scientific men continued in the belief that the lungs were the main or only seat of oxidations in the body. The theory of Lagrange assumed the presence in the blood both of oxygen and carbonic acid, but the demonstration of this fact demanded far more perfect apparatus than was then available. We have to wait until 1837, after the invention of the mercurial air pump, when Gustav Magnus (1802–1870), professor of physics at Berlin, settled the controversy. By the Torricellian vacuum he was able to extract both from arterial and venous blood oxygen and carbonic acid, though in different proportions, together with a small proportion of nitrogen. He found that the percentage of oxygen was greater in arterial blood and of carbonic acid in venous blood. Magnus supposed that gas exchanges in the lungs between the air and the blood took place according to the familiar law of diffusion, the gases being held in the blood in simple solution.

But in 1857 Lothar Meyer (1830–1895) showed that the amount of oxygen liberated from the blood does not increase proportionately to the diminution of pressure in the air pump, as it should according to Dalton's law, but that the oxygen does not begin to come off in quantity until the pressure upon the blood has been reduced to one-fiftieth of an atmosphere. The meaning of these facts is, broadly speaking, that oxygen diffuses from the air cells of the lungs into the moist lining epithelium, thence to the lymph within the tissue spaces, thence through the moist walls of the pulmonary capillaries; it is there taken up by the circulating blood plasma. All this is supposed to proceed according to the law of diffusion. Now comes into action a vital mechanism of surpassing importance, the hemoglobin confined within the red corpuscles.

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[18] Foster, M. *Op. cit.*, p. 253.

This substance has an extraordinary affinity for oxygen. Crudely speaking it sucks up the oxygen from the fluid in which it swims and packs it away among its chemical side chains. Hemoglobin can thus absorb many times its own volume of oxygen condensed in the chemical compound, oxyhemoglobin. It can thus reduce the tension of oxygen in the blood plasma to about $\frac{1}{50}$ of an atmosphere and still under normal conditions the hemoglobin of the red corpuscles in the pulmonary veins is nearly saturated with oxygen. These vehicles hurry on their course throughout the body and wherever there is oxygen deficiency below a partial pressure of about $\frac{1}{50}$ of an atmosphere a portion of the cargo is unloaded until, after passage of the capillaries, and in proportion to the activities of the living tissues, the load of oxygen is sensibly decreased. The scarlet color of the arterial blood changes in the veins to a bluish tint, due to admixture of reduced hemoglobin, the color of which is bluish-black.

Our story has thus led oxygen up to the threshold of the tissues. As the avidity of hemoglobin for oxygen had charged with it the erythrocytes in the lungs, so the hunger of the living tissue cells for the same vital element unloads the corpuscles with an urgency proportionate to the energy needs of the body. Entering the tissues, respiration, as commonly understood, ceases and metabolism begins.

We here reach the boundary of misinterpretations that had endured through the ages.

Thought had ripened in a fruitful field of facts and as if by inspiration scientific men began to perceive the meaning of animal metabolism.

Modern pathology teaches that the occurrence of infectious disease postulates indubitably the previous inclusion within the sick body of a foreign entity which ferments without visible expression for a longer or shorter period of incubation. Like germs, ideas have their waves with troughs of dormancy and crests of reproduction; their periods of incubation and variations in virulence. A susceptible mind conceives and gives birth to a thought which represents a truth in Nature. It seems to fall stillborn; but no, it has infectivity and after a longer or shorter time it is born again, and at its second birth it finds not single minds only, but hosts of minds prepared to react to it.

Our little review seems to show that the discovery of a general truth needs two conditions: first, the ready, apprehensive mind; second, a fund of appropriate facts collected through various sources for an indefinite period. Harvey's was the ready mind adequately furnished with substantial facts regarding the circulation of the blood whence he was able to educe the truth, even though he lacked the final proof provided by Malpighi. But he failed to explain the respiration because the fundamental facts were wanting. No incident of his life better displayed scientific greatness than his self control in renouncing the temptation to build hypotheses out of what he recognized as insufficient data upon the subject of respiration.

Much later Priestley with admirable skill isolated gas which supported combustion brilliantly and in which animals could live; but the meaning of his discovery was perverted through a premature and erroneous theory.

He visited Lavoisier and probably described his production of "completely dephlogisticated air." But Lavoisier sensed the true explanation and within two years had isolated oxygen and proved that both combustion and respiration represented essentially the combination of oxygen with combustible matter.

I may venture to add one incident from our own times. Henry Newell Martin, whom Huxley and Foster had recommended as incumbent of the chair of Biology in the new Foundation, Johns Hopkins University, set himself immediately to the organization of biological research. Further progress in the physiology of the mammalian heart seemed to demand that the experimental conditions be simplified by isolating the organ from the rest of the body.

The problem was how to effect the return of the blood from the aorta directly to the right auricle without passing through the complicating systemic circulation. One sleepless night in 1881 the solution of the riddle flashed through Martin's mind. He realized that were the main stem of the aorta clamped the circuit of the blood might be completed through the walls of the heart itself by way of the coronary vessels.

The next morning he told his assistant of his idea. So, after laboratory hours, a dog was anesthetized, the heart laid bare, the cavae and aorta were ligated and, under artificial respiration, the heart functioned normally within a dead body. More than three hundred years after the birth of Harvey, but the ready mind appeared.

Our story has shown that mere incidents are abortive without a plot to give them meaning. One cannot but wonder if such a history does not contain elements which challenge further interpretation. The science of genetics is built on the laws of chromosomes and plasms.

But in a sense, not wholly figurative, mind inseminates mind and Thought has its evolution as truly as Soma.

Physicists have declared that matter and energy are but different phases of the same entity. Perhaps one day some Mendel of the mind may establish a formula which will make education as exact as mechanics.

We can now hurry to our goal. It was not until after the middle of the nineteenth century that it became established that the solid tissues themselves were the essential sites of oxidation of the body, a conception already advanced by John Mayow long before. Regnault and Reiset, Hoppe-Seyler, Pflüger, Ludwig, and their pupils, gave wonderful impulse to physiological research. Gas analysis of the blood, introduced by Magnus, formed a special field in this development and must be looked upon as a direct predecessor of what is now a range of biochemistry that is of daily use to practical clinicians. The human body itself was shown to be a machine which operates under the law of conservation of energy.

Americans should not forget that it was W. O. Atwater who, as professor of chemistry at Wesleyan University, in the middle nineties constructed the first respiration-calorimeter which approached mechanical perfection; and with his colleagues, the late E. B. Rosa and F. G. Benedict, initiated researches in animal metabolism which form a worthy sequel to the earlier work.

SUMMARY OF PROGRESS IN THE PHYSIOLOGY OF RESPIRATION

1. Harvey (1578–1657), after a century of predecessors beginning, perhaps, with J. Sylvius (1478–1555) and ending with Sarpi (1552–1623), cleared the way for the understanding of respiration by his demonstration of the circulation of the blood.
2. Van Helmont (1577–1644) discovered "gas sylvestre," carbonic acid.
3. Boyle (1627–1691) proved that air is alike necessary to respiration and combustion.
4. Hooke (1635–1703) proved by blowing air from a bellows over the exposed lungs of a dog that respiratory motion was not necessary to maintain life.
5. Lower (1631–1691) proved that something was absorbed from the air in the lungs

which turned dark blood bright red. He first performed direct transfusion of blood from animal to animal.

6. Mayow (1643–1679) proved that it was a definite constituent of air which, taken up by the blood, turned it from dark red to scarlet. He called it the "nitro-aereal spirit of the air," and determined its properties—a gas known as oxygen.

7. Black (1728–1799) rediscovered "fixed air," carbonic acid, and defined its properties.

8. Stahl (1660–1734) obstructed progress with the phlogiston theory for a hundred years.

9. Priestley (1733–1804) discovered de-phlogisticated air, or oxygen, but misunderstood its function in combustion and respiration.

10. Lavoisier (1743–1794) discovered oxygen and defined its true relation to combustion and respiration—as a synthesis with carbon and hydrogen.

11. Lavoisier and Laplace (1749–1827) showed that respiration is a combustion, only slower than that of ordinary fire. They supposed the oxidation to be limited to the lungs, the heat being absorbed therefrom and transported by the circulation throughout the body.

12. Lagrange (1736–1813) advanced the idea that the principal oxidations of the body occurred not in the lungs but in the blood, combining there with carbon and hydrogen; the products returned to the lungs by the venous blood were there expired.

13. Spallanzani (1729–1799) proved that the tissues themselves respired, i.e., absorbed oxygen and gave off carbonic acid.

14. Gustav Magnus (1802–1870) with the mercurial air-pump (Torricellian vacuum) extracted both oxygen and carbonic acid, with a little nitrogen from the blood.

15. Lothar Meyer (1830–1895) showed that the O_2 was not held in simple solution in the blood, but came off in quantity only when the air pressure was reduced to $\frac{1}{50}$ atmosphere.

16. The law of the conservation of energy was applied to the living body; the principal seat of oxidations was located in the tissues; metabolism and nutrition were studied by a long line of investigators, including Regnault (1810–1878), Hoppe-Seyler (1825–1895), Pflüger (1829–1910), Bert (1830–1886), Voit (1831–1908) and Atwater (1844–1907).

STUDIES IN PALEOPATHOLOGY XX

VERTEBRAL LESIONS IN THE SABRE-TOOTH, PLEISTOCENE OF CALIFORNIA, RESEMBLING THE SO-CALLED MYOSITIS OSSIFICANS PROGRESSIVA, COMPARED WITH CERTAIN OSSIFICATIONS IN THE DINOSAURS

By ROY L. MOODIE, PH.D.

CHICAGO, ILLINOIS

PATHOLOGICAL changes in or adjacent to muscle tissue resulting in the formation of isolated plaques, exostosial growths, or of continuous sheets of bone, usually occurring in the belly of the muscle and involving its tendinous endings, have been known for many years under the general heading of myositis ossificans. The medical literature on the subject is vast, one author in 1918 listing nearly nine closely printed octavo pages of references to one phase of the subject. It will obviously be of no advantage to go into a review of this material, so we will restrict our statements to guiding points in this body of literature.

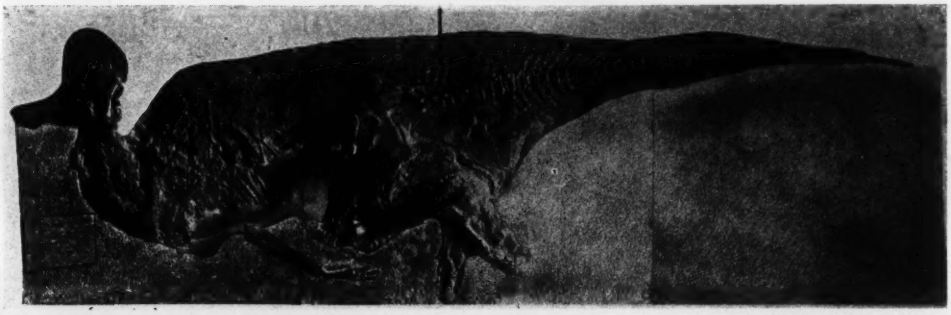

Fig. 1. A Skeleton of *Corythosaurus Casuarius* (Brown) a Swimming Dinosaur, Showing Ossified Tendons (at the Point of the Arrow) in the Anterior Caudal Region. This Is Thought to Have Been an Aquatic Animal, Hence the Greater Development of the Caudal Muscles Resulting in Ossifications in the Tendons Which Attached the Muscles to the Skeleton. After Brown. About 1/30 Natural Size.

Lewis[1] has recently summarized the subject in relation to its surgical aspects. A number of other recent writers have contributed to our understanding of the subject. Apparently the earliest printed reference to this condition is that of John Frecke,[2] who in 1740 described a most unusual condition in the back of a boy. I have not seen this paper myself but doubtless Frecke's predecessors knew of the hardening of muscle tissue and may have commented on it. Münchmeyer[3] is credited by Krause and Trappe[4] with having proposed (1869) the name myositis ossificans progressiva for a phase of this rare disease supposed to involve the muscles in a manner making movement increasingly difficult, so that in time, if the patient lived, and many of them did, voluntary movement became impossible. One individual had such an involvement of bony growths that all his limbs, neck and back were fixed, and if turned on his back his limbs and head were held fixed by these growths. Rosenstirn[5] has published a most elaborate review of 120 cases in which the condition of myositis ossificans progressiva was indicated. He gives a bibliography of 200 titles. The prevailing cause of the bony growths was found to be trauma.

Magruder[6] has called attention to and gives a roentgenogram of a curious condition of the great toe, which he and Rosenstirn[5] call microdactylia or brachydactylia, often noted as accompanying myositis ossificans progressiva. There is thought to be an hereditary tendency in the association of these conditions but I do not find that this phase of the subject has been critically studied. I thought it would be of great interest and importance in fixing a diagnosis of the condition seen, and to be immediately described, in the sabre-tooth (*Smilodon*) of the Rancho la Brea, Pleistocene of California, if indications of microdactylia or brachydactylia or even marked exostoses could be determined in the phalanges of this animal. But after a careful count, examination and even measurements of several thousand phalangeal elements of this giant cat in the collections of the Los Angeles Museum of History, Science and Art, nothing was ascertained that would even suggest such a condition. There are low and usually blunt exostosial growths adjacent to the articular surfaces of the phalanges but these are all of arthritic origin.

Fay and LeCount[7] have studied, in the human, the histological nature of the so-called ossifying myositis and have concluded that they were not dealing with altered muscle tissue but with results of osteoblastic activity, due doubtless to trauma of an adjacent bone. The lesions are probably parosteal and the term myositis ossificans is misleading. Carey[8] has studied an interesting case, giving a full account and histological study of the materials. He is not convinced that the so-called myositis is other than parosteal.

In view of the fact that there has never been a discussion of this unusual condition in mammals other than man, and none of the condition in extinct forms, the following discussion and attempted interpretations are offered as a contribution to this phase of pathology. It gives yet another suggestion as to the value of paleopathology in an understanding of the nature of disease.

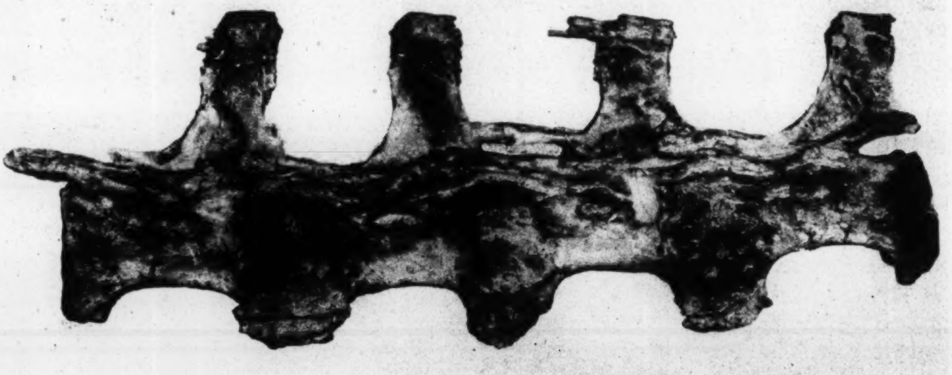

FIG. 2. CAUDAL VERTEBRAE (SIXTEENTH TO NINETEENTH INCLUSIVE COUNTED FROM THE SACRUM) OF A HUGE DINOSAUR, *Diplodocus sp.*, IN THE U. S. NATIONAL MUSEUM, SHOWING LESIONS OF SPONDYLITIS DEFORMANS COVERING THREE JOINT SURFACES, AS WELL AS OSSIFICATIONS OF THE INTERSPINAL LIGAMENTS, FOR COMPARISON WITH THE SABRE-TOOTH VERTEBRAE (FIG. 5). THE INTERSPINAL LIGAMENTS ARE EVIDENT IN THE BRIDGE OF BONE BETWEEN THE BASES OF THE TWO MIDDLE SPINES AND IN THE POINTED PROJECTIONS DIRECTED TO THE LEFT OF THE FIRST SPINE ON THE LEFT AND FROM THE THIRD SPINE. THE OSSIFICATIONS OF THE LATERAL LIGAMENTS ARE TO BE SEEN IMMEDIATELY BELOW THE BASES OF THE NEURAL SPINES. GREATLY REDUCED.

OSSIFIED TENDONS

Since muscle tissue is so largely composed of sarcous material, the contractile part, and of connective tissue or the adventitious and tendinous part, it will be well to enquire into the nature of the tendinous material which is known to have been preserved in fossil form and to compare its structure with that of the lesions seen in the vertebra of *Smilodon*. This is important because it seems probable that all examples of myositis ossificans are ossifications of the tendinous, connective tissue, material in which the muscle is involved. I know of no involvement of the sarcous material in cases of myositis.

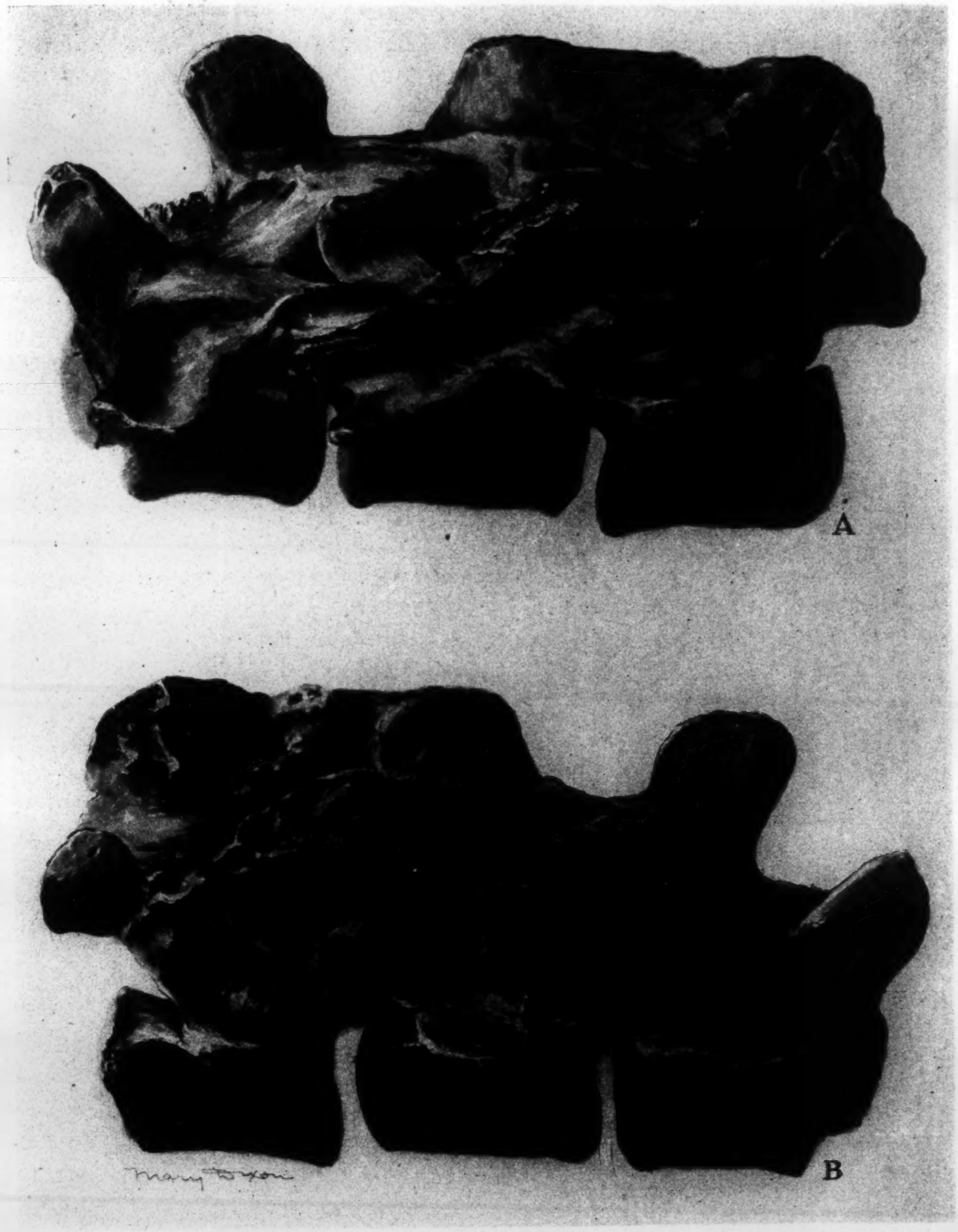

Fig. 3. Lesions Resembling Myositis Ossificans in the Sabre-Tooth. An Ankylosed Block of Three Lumbar Vertebrae (Nos. 4, 5, 6) of the Pleistocene Sabre-Tooth (*Smilodon Californicus*) from the Rancho la Brea Asphalt Pits on Wilshire Boulevard, Los Angeles, California, Showing the Development of the Lesions Resembling Myositis Ossificans Progressiva on Both Sides of the Vertebral Spines. Two Bellies of Ossified Muscle Are Suggested in "a" and One Large One in "b." The Interspinous Ligaments of Two Vertebrae are Thoroughly Ossified, but the Vertebral Centra are Free. Spondylitis Deformans Accompanying Ossification of Muscles Is Shown in Figure 5c and in Figure 6d, but There is No Uniformity in Occurrence and the Two Conditions Are Apparently not Correlated. Specimen Preserved in the Museum of History, Science and Art, Exposition Park, Los Angeles, California. Length 195 mm.

The sarcous elements are, however, capable of preservation in fossil form and this has been often noted. It is well known that tendons, under the effects of undue stress or of age, become ossified. Ossification of tendons in fossil vertebrates is well known although there have been no accounts published dealing with the anatomical and histological nature of these structures. Since ossified tendons occur so often and so abundantly in the ancient dinosaurs and since this subject is of interest to us here I am giving a brief account of their nature.

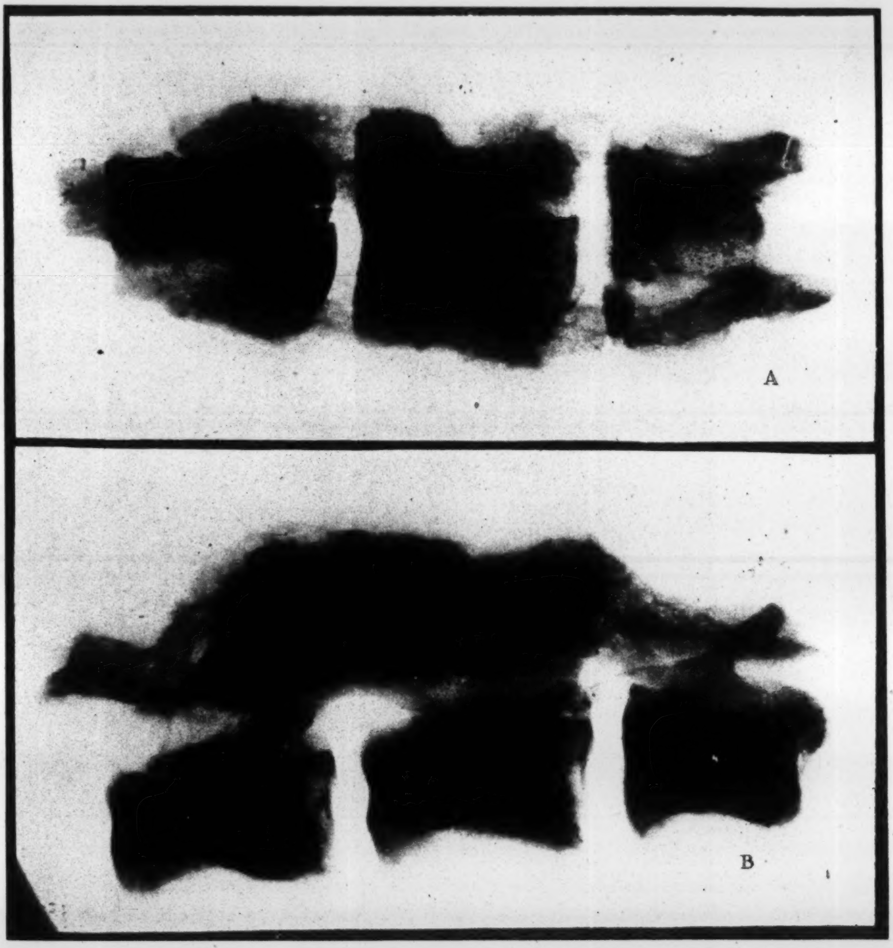

Fig. 4. Roentgen Ray of Myositis Ossificans. These Roentgenograms of the Block of Lumbar Vertebrae Showing Myositis Ossificans, Pictured in Figure 3, Are the Best of Several Attempts. The Vertebrae Are Evidently Infiltrated with Soil Impregnated with Petroleum, Rendering the Passage of the Rays Difficult. They Show, However, Enough of the Architecture of the Bones to Justify Their Publication in This Place. a. Roentgenogram from the Ventral Surface Showing the Structure of the Vertebral Bodies. b. Roentgenogram from the Side Showing a Dense Shadow, to the Left, of One of the Heavy Lesions, Shown on the Right of Figure 3a.

A more extensive account will appear elsewhere.

I have asked Mr. Charles Gilmore, Curator of Vertebrate Paleontology, U. S. National Museum, Washington, D. C., to write the following account of the ossified tendons found in dinosaurs. He has also furnished the photographs shown in Figures 1 and 2.

Long, attenuated bony rods, found in certain dinosaurian reptiles, lying along the sides of the neural processes of the vertebrae have long been recognized as ossified tendons. When found undisturbed they extend from forward of the mid-dorsal region backward over the sacrum and down onto the distal half of the tail. Their greatest development both in size and numbers is usually above the sacrum.

In the specimen of *Corythosaurus*, where the tendons occur in the natural relationships, Brown observes[9] that they are disposed in two layers, an outer and an inner. In each series the rods of bone lie parallel to one another and both series are diagonal to the axis of the vertebral column. He says:

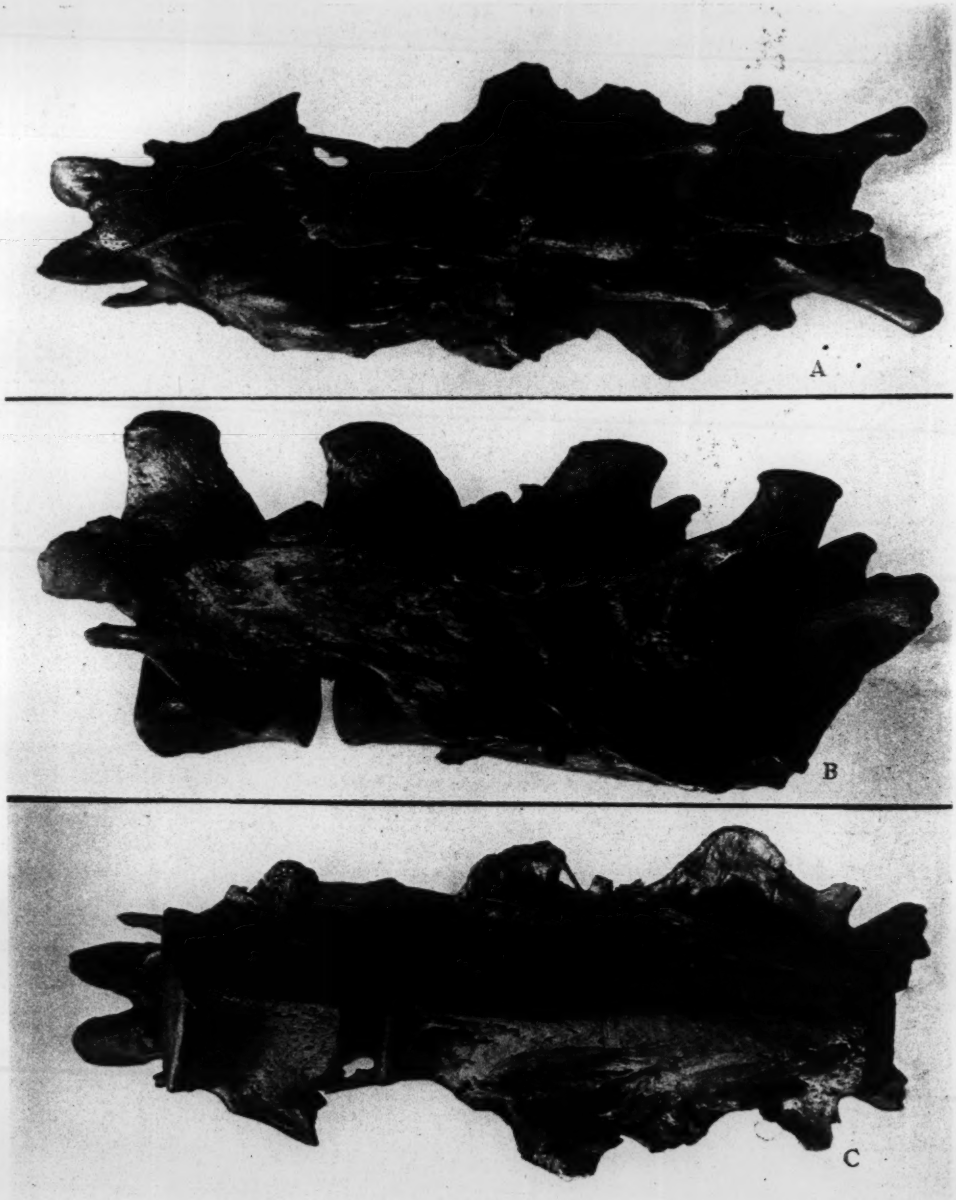

Fig. 5. The Lesions of Myositis Ossificans Associated with Spondylitis Deformans. These Three Photographs Show (a) the Dorsal, (b) the Lateral and (c) the Ventral Aspects of a Block of Four Lumbar Vertebrae (Nos. 2, 3, 4, 5) of *Smilodon Californicus*, Exhibiting Lesions of Myositis Ossificans, Spondylitis Deformans, Ossification of Lateral Ligaments, and Ossification of Minor Ligaments as Shown in c, Middle of Upper Edge. The Interspinous Ligaments Were Not Affected. Length of Block, 240 mm.

"The tendon bones are clearly the calcified terminal parts of the large, deep-seated, muscles that moved the vertebral column segments in series."

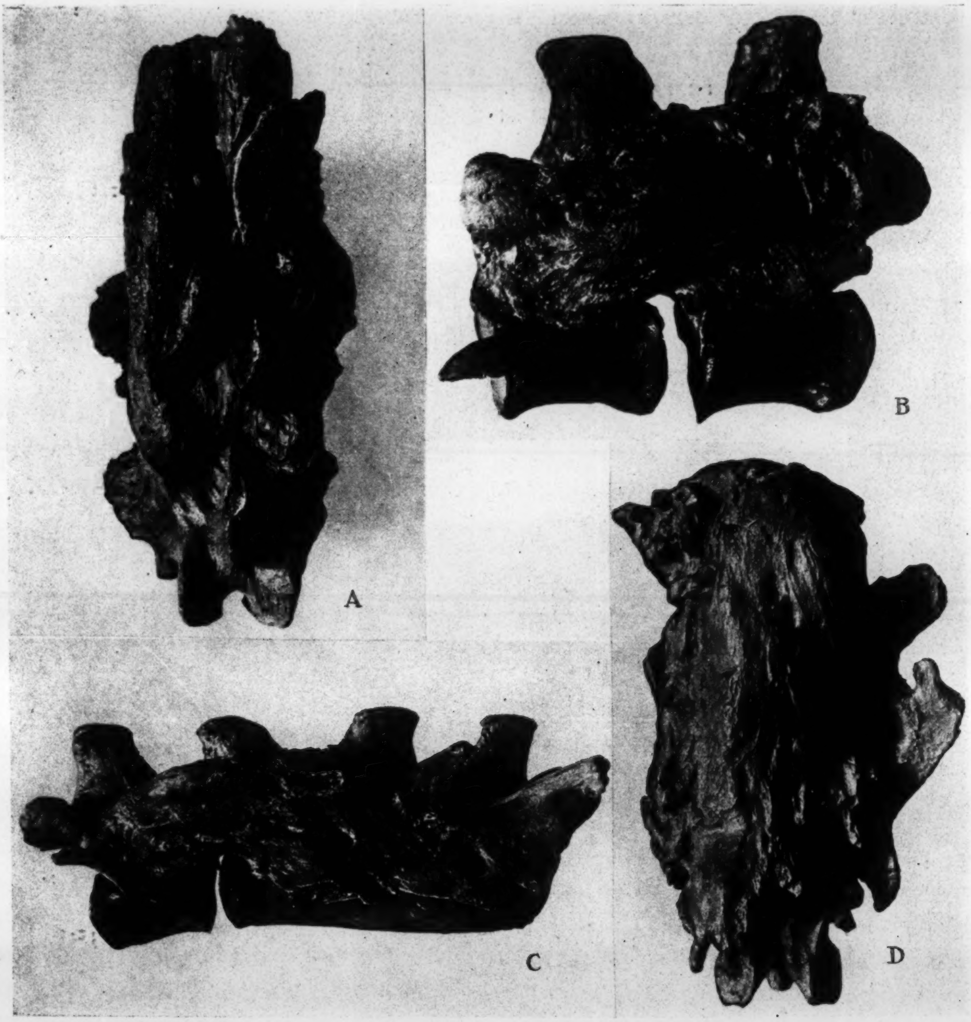

Fig. 6. Lesions Resembling Myositis. a. Dorsal Aspect of a Solid Block of Three Vertebrae (Lumbars 4, 5, 6) of the Sabre-Tooth Showing, on the Left, an Advanced Condition of the Lesion Thought to be Myositis Ossificans Progressiva. The Broken End of This Block Indicates That the Lesion Extended on to, at Least, One Other Vertebra and Possibly Others. This is the Most Extensive Lesion Thus Far Seen. Length, 190 mm.

b. A Broad Lesion, Apparently That of Myositis, Unites These Two Lumbar (4, 5) Vertebrae Which are Otherwise Normal. Length, 130 mm.

c. A Block of Four Vertebrae (Lumbars 2, 3, 4, 5) Showing Large Lesion of Myositis. This Specimen is Shown in Figure 5, a, b, c, but This Picture, Taken from a Different Angle, Shows the Lesion More Clearly. Length, 240 mm.

d. Ventral View of Block of Vertebrae (Lumbars 2, 3, 4) Showing Complete Ossification of the Ventral Longitudinal Ligament, Producing an Exaggerated Condition of Spondylitis Deformans, Associated with Myositis. The Lipping of the Lesion and the Unaffected Articular Surface Are Shown at the Lower End of the Picture. Length of Ossified Vertebral Ligament, 135 mm.

Ossified tendons seem to be present in all of the bipedal members of the dinosaurian order Ornithischia, having been observed in the Camptosauridae, Iguanodontidae, Hadrosauridae and Hypsilophodontidae. They are also present in the quadrupedal Ceratopsia. So far as I know at the present time, ossified tendons are not found with any of the armored dinosaurs but do occur to a limited extent in the Sauropoda.

A specimen of *Diplodocus* now undergoing preparation in the U. S. National Museum displays in the mid-caudal region ossification of vertebral ligaments, but no tendons such as one might expect in a long-tailed animal. Pointed projections of bone (Fig. 2) extending forward and backward from the tops of a few of the caudal vertebrae represent the ossification of the interspinal ligaments, likewise seen in *Smilodon*, but these have nothing to do with tendons. These ossifications have their greatest development between the seventeenth and eighteenth caudals and this is where in several known *Diplodocus* tails coossification of the caudals takes place, due to the ossification of the ventral vertebral ligament. None of these upper pointed projections meet to form a continuous bar, but near the base of the spinous processes of vertebrae seventeen and eighteen a rounded bar joins the two spines (Fig. 2). These ossifications differ from those found in the Ornithischia by being interspinal instead of lateral to the neural spines. That they develop here at all is probably due to the same causes as the coossification of the centra and the consequent stiffening of this portion of the tail. Injury or extreme old age might be contributing factors in the development of these unusual ossifications, for it is a well-known fact that coossification of bones often takes place in very old individuals. One of these conditions, however, that of spondylitis deformans is not dependent on age. It is important in considering the nature of ossifications in extinct animals to note the differences between ossification of ligaments as distinct from tendons.

A careful account of tendon bones is being prepared and will be printed shortly.[10] In Figure 9 I am showing, in four pictures, the histological structure of an ossified tendon from near the sacrum of *Trachodon annectens*, a large dinosaur from the Cretaceous of Montana. It is not necessary here to go into detail about the nature of the minute structure of these ossified tendons, since this will be dealt with in the special publication spoken of above. I wish to point out the great differences between these muscle terminations and the so-called lesions of myositis ossificans progressiva shown in Figure 10. The structural features are widely different. It is to be kept clearly in mind however that there is a wide difference in histological structure between the skeleton of the normal healthy mammal, *Smilodon*, and the dinosaurs. These differences have been commented upon and fully illustrated in my book, "Paleopathology." We should, however, expect to find a greater degree of conformity between the structural features if the lesions in *Smilodon* really were ossifications in the tendons rather than parosteal growths from the vertebrae. The histological evidence goes to show that the lesions in the sabre-tooth are parosteal in nature

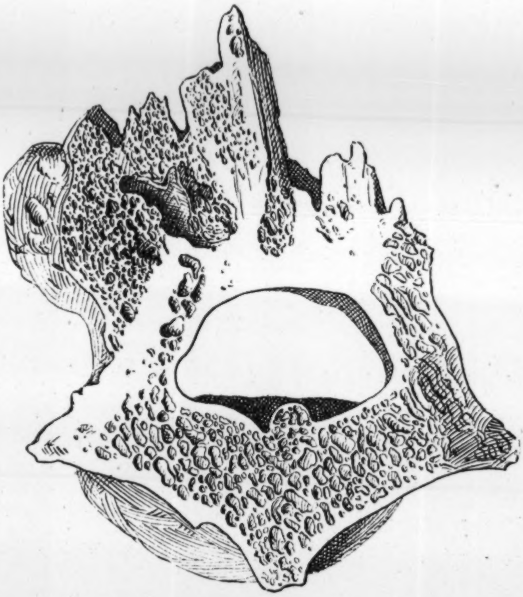

FIG. 7. A TRANSVERSE SECTION THROUGH A LUMBAR VERTEBRA (6) OF THE SABRE-TOOTH (*Smilodon Californicus*) SHOWING ON THE LEFT ABOVE, THE RELATIONS BETWEEN THE VERTEBRA AND SPINE, AND THE LESION OF MYOSITIS OSSIFICANS PROGRESSIVA. THE CLEAR SPACES, IN THE DRAWING, REPRESENT AREAS OF SOLID BONE IN WHICH THERE ARE FEW OR NO SPACES. THE LARGE SINUS ON THE LEFT, ABOVE, IS PART OF THE ORIGINAL SPACE BETWEEN THE MUSCLE AND THE SPINE OF THE VERTEBRA. THE VERTEBRAL BODY IS UNAFFECTED. GREATEST WIDTH OF SPECIMEN, 65 MM. DIAMETER OF LESION SHOWN IN UPPER LEFT OF DRAWING, 25 MM. THIS LESION FURNISHED THE MATERIAL FOR THE SECTIONS SHOWN IN FIGURE 10.

and show no histological features of tendons. There are no indications of disease in the tendon bones; nor do these dinosaurian tendons in any way suggest sesamoid ossifications but are really long slender rods of bone such as may be developed in any long tendon which is subjected to great and continuous strain.

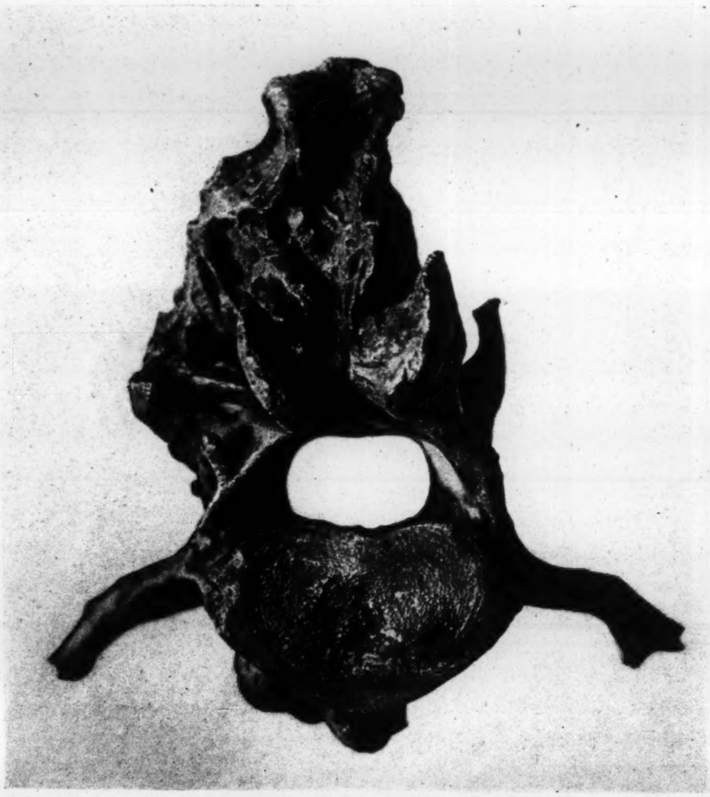

Fig. 8. End View of the Lumbar Vertebra of *Smilodon* Showing Mass of Pathological Bone on the Spine and Arch, Leaving the Body of the Bone Free. The Mass is Apparently Composed of Ossified Ligaments and Tendons. Distance between Tips of Transverse Processes (Broken), 100 mm. Height of Specimen, 130 mm.

Ossification in tendons is also brought about by the stress of supporting heavy parts. It may be compared with the ossification of ligaments in such pathological conditions as those seen in spondylitis deformans or other phases of vertebral ankylosis[11] thought to result from undue strain, to the constant impact of part on part, as in the contact of the edges of adjacent vertebral bodies, or as a phase of senility in which many parts tend to ossify. The distinction between the ossification of tendons and the extension of bony growths into the sarcous portion of the muscle forming a union with the tendon is very slight. The difference between tendons and parosteal growth, however, is large and important. The condition of muscle invasion is supposedly pathological in nature, thought to result from trauma, either direct impact or severe and continuous strain, but there is no difference between this supposedly pathological condition and that seen in ossified tendons. We are largely restricted to assumptions of etiology in dealing with fossil material and our interpretations must be made with caution.

Vertebral Ankylosis

An appearance of relatively rare occurrence in the Pleistocene sabre-tooth (*Smilodon californicus*) is that of lesions in the lumbar region which look like ossified bellies of parts of the musculus longissimus dorsi. From its occurrence almost exclusively in the lumbar vertebrae, unprotected by ribs, one may judge that these lesions are due to trauma. The exostoses look like ossified muscle, having the form, texture and position of muscles of the back.

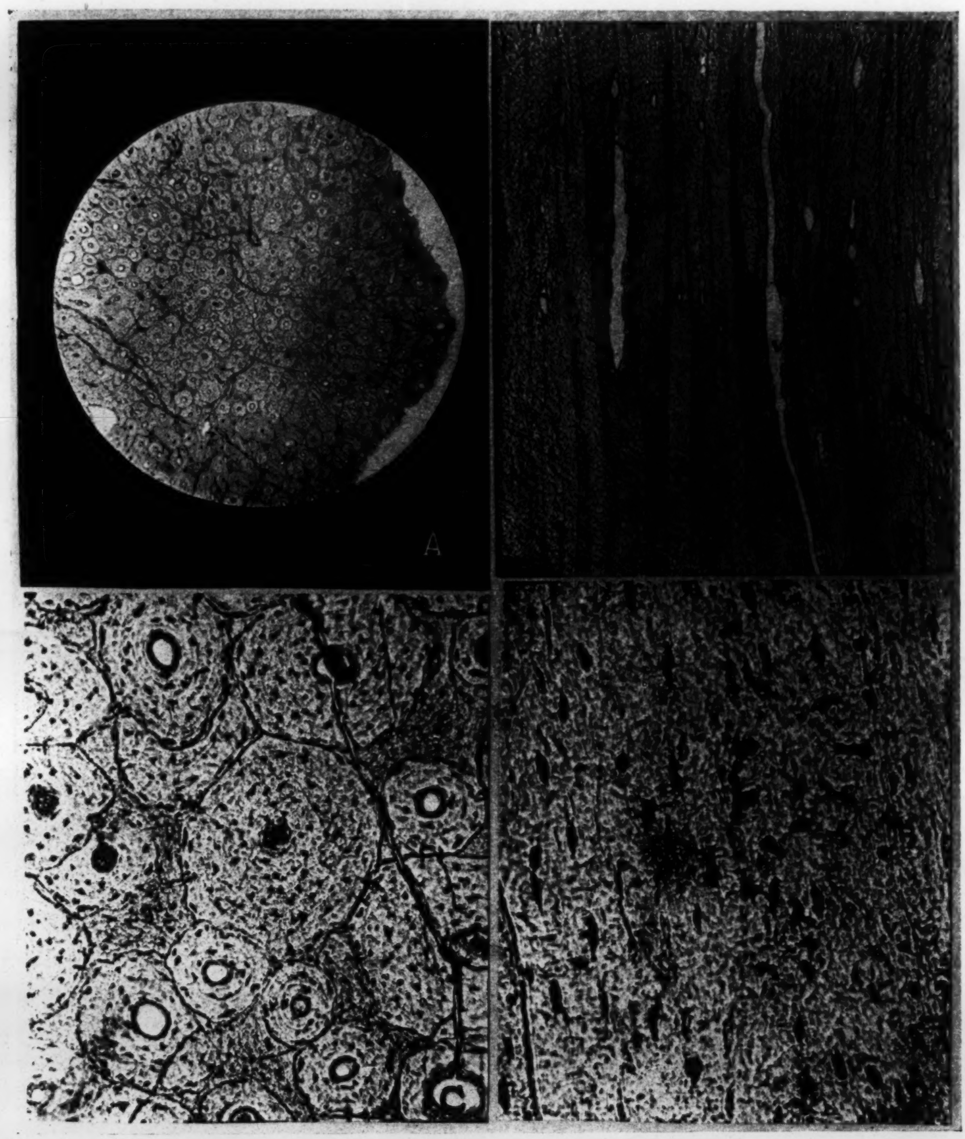

Fig. 9. Histology of Dinosaur Tendon. a. Cross Section of an Ossified, Fossilized Tendon from Near the Sacrum of *Trachodon Annectens*, Cretaceous, Lance Formation Near Hell Creek, Montana. × 50. Material Furnished by Mr. Barnum Brown of the American Museum of Natural History.

b. Longitudinal Section of Same. The Long Clear Channel Is Possibly a Post-Fossilization Crack, but It May Be a Vascular (Haversian) Canal. × 70.

c. Cross Section of Same, Enlarged. × 300.

d. Longitudinal Section of Same, Enlarged, × 600. Bacteria of Decay are Probably Responsible for the Enlarged and Distorted Lacunae Seen Near the Upper Left of This Picture. An Enlarged Perforating Fiber of Sharpey Crosses Diagonally the Lower Left Corner.

No discussion of such an appearance has ever been printed and our knowledge of the nature of such lesions in fossil forms is confined to my studies on this Pleistocene material. In a letter dated April 21, 1922, Professor O. Abel of Vienna wrote me of his discovery of what he regarded as lesions of myositis ossificans in the lower arm bones of a cave-bear, collected from the chiropterite (fossil bat guano) at Steiermark, Austria. A recent letter (May 25, 1926) from Dr. Richard Breuer at Vienna, to whom Dr. Abel has assigned the fossil material for study, gives further data:

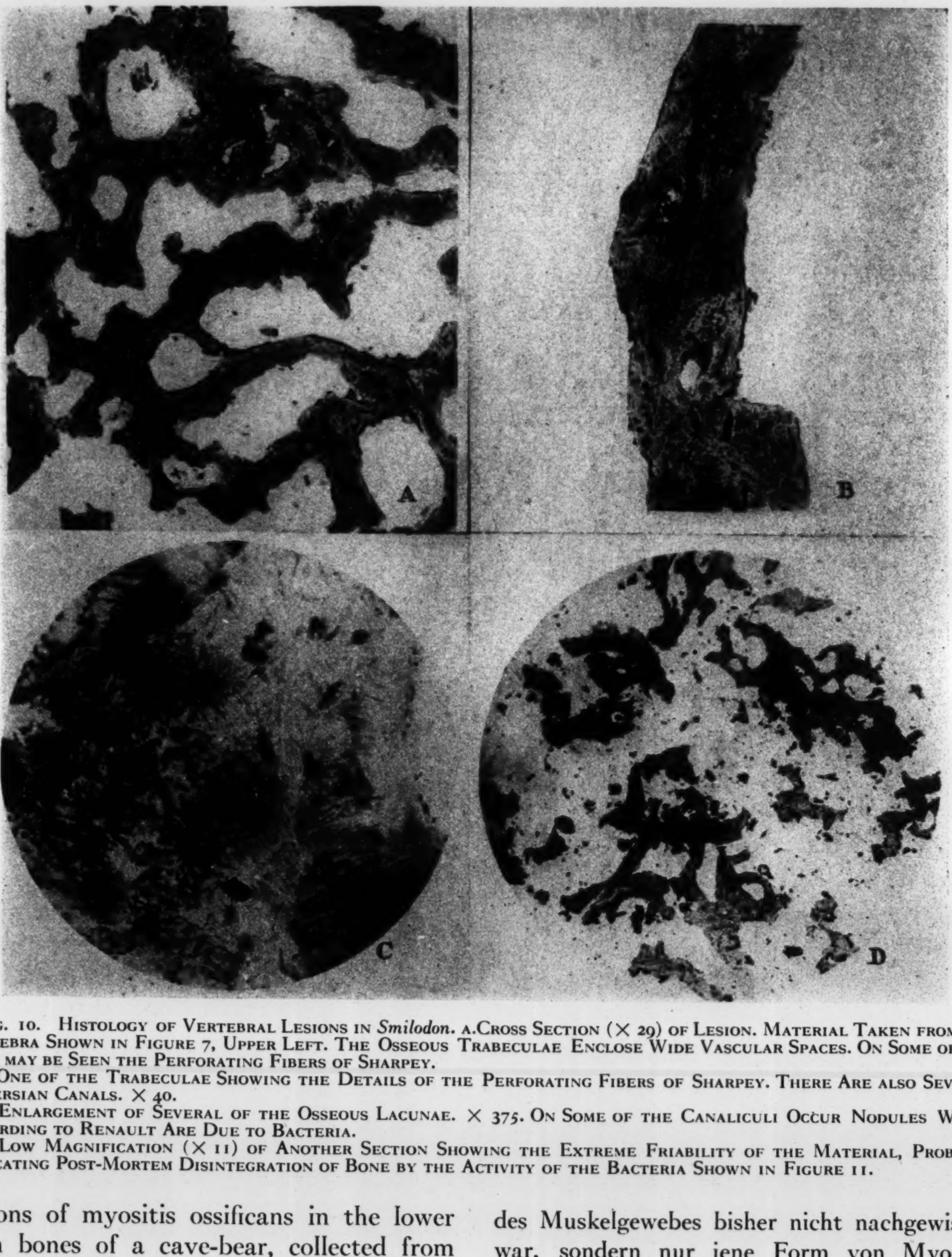

Fig. 10. Histology of Vertebral Lesions in *Smilodon*. a. Cross Section (× 29) of Lesion. Material Taken from the Vertebra Shown in Figure 7, Upper Left. The Osseous Trabeculae Enclose Wide Vascular Spaces. On Some of the Bars May be Seen the Perforating Fibers of Sharpey.
b. One of the Trabeculae Showing the Details of the Perforating Fibers of Sharpey. There Are also Several Haversian Canals. × 40.
c. Enlargement of Several of the Osseous Lacunae. × 375. On Some of the Canaliculi Occur Nodules Which According to Renault Are Due to Bacteria.
d. Low Magnification (× 11) of Another Section Showing the Extreme Friability of the Material, Probably Indicating Post-Mortem Disintegration of Bone by the Activity of the Bacteria Shown in Figure 11.

> Als vorläufiges Ergebis meiner Studien kann ich nur mitteilen, dass eine Myositis ossificans des Muskelgewebes bisher nicht nachgewissen war, sondern nur jene Form von Myositis ossificans an den Knochen des Mixnitzer Ursus spelaeus gefunden wurde welche zu knöchernen

Auswüchsen und Auflagerungen aus Ausatze der Muskeln und Sehnen führt.

Dr. Breuer further writes that a description, with figures, of these interesting structures is in press.

In the Los Angeles Museum of History, Science and Art at Exposition Park there are skeletal elements of nearly 900 individuals of the sabre-tooth (*Smilodon californicus*), young and adult, which have been assembled from the asphalt pits of the Rancho la Brea on Wilshire Boulevard. Among this vast assemblage there are more than two dozen examples of the characteristic lesions resembling those of myositis ossificans progressiva. Some of the lesions form huge masses of tissue extending over four vertebrae and some are confined to a single vertebra, though all have the characteristic form of a muscle belly. For the very reason that some of the lesions are large, long and extensive, some small and short, I have used the term myositis ossificans progressiva of Münchmeyer to indicate a comparison with human conditions which have at times caused total helplessness. The use of the term does not indicate a definite diagnosis. No wild animal could survive even partial helplessness since it would thus become easy prey to its pitiless associates. It is hardly credible that, handicapped as some of the tigers were with extensive vertebral ankylosis, they were not destroyed.

Lesions of this type are unknown in any other fossil form. Their nature is shown in Figures 3 to 7. The growths are always quite spongy, with numerous small and large vascular spaces, as shown in Figure 10A. The vertebral lesions which resemble myositis ossificans progressiva can always be distinguished from the other more common ossifications of the ligaments (See Fig. 5). The ligaments involved in spondylitis deformans have the same appearance and relations both in the dinosaurs (Fig. 2) and the sabre-tooth (Fig. 5C); as do likewise the other ligamentous ossifications, i.e., the laterals, interspinals, etc. shown in the same figures.

The following measurements show the great variations in the length of the vertebral lesions of *Smilodon* resembling myositis ossificans progressiva. The number of vertebrae involved is also indicated:

No. of specimen	Vertebrae involved	Length in mm.
1	3	178
2	2	120
3	2	110
4	3	160
5	2	120
6	4	210
7	2	150
8	2	132
9	4	240
10	3	190
11	2	105
12	1	34
13	2	130
14	2	150
15	2	110
16	2	170
17	2	130
18	1	50
19	2	120
20	2	125
21	2	100
22	2	100
23	2	125
24	2	100
25	2	120

RÉSUMÉ

It is difficult to explain the nature of these vertebral lesions in *Smilodon*, and it is hard to establish a safe diagnosis in view of the uncertainty existing in the understanding of similar lesions in human pathology. I shall adopt the safe method of offering three suggestions under one of which these lesions may be placed when more is known of the condition among other fossil vertebrates, and when the nature of myositis ossificans is more clearly established.

1. The factors which indicate that these Pleistocene lesions found along the lumbar vertebrae of *Smilodon*, from the Rancho la Brea, are actually examples of myositis ossificans progressiva are: (a) that the lesions look like muscles; (b) the structure and appearance of the large lesions are quite different from those lesions known to be ossifications of ligaments; (c) the change of

the lesions in size and extent in the different individuals represent a progressive change such as is found in modern examples of myositis ossificans progressiva; (d) the pathological growths are usually found centering around the zygopophyseal articulations, where the spinal muscles insert; (e) the lesions are often separated by definite spaces from the adjoining bone as shown in Figure 7.

2. I am indebted to Dr. A. W. Meyer of Stanford University for the suggestion that the lesions seen in the sabre-tooth may be formed under the muscles by a physiological distortion of the bone due to pull and pressure. He has cited a human example[12] in which the head of the humerus has been moulded by the surrounding muscles until the outer aspect of the bone looks like the musculus deltoideus. Similarly the musculus longissimus dorsi may have so pressed upon the vertebrae of the sabre-tooth that the pathological condition may have resulted. Just how this physiological distortion may have been influenced by trauma is uncertain.

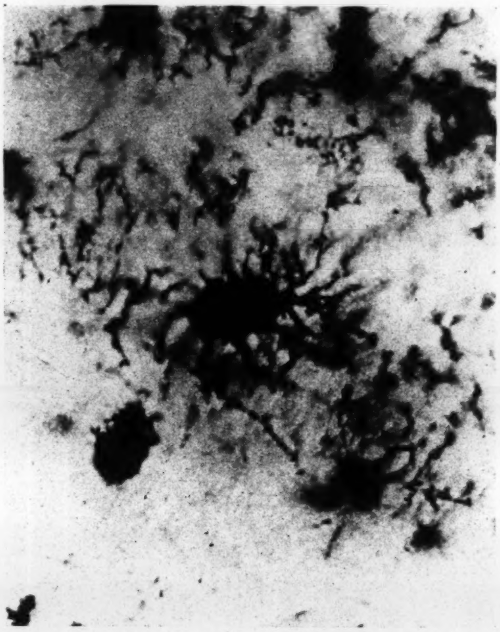

Fig. 11. Enlargement of One of the Lacunae of the Vertebral Lesion Shown in Figure 10c and in Figure 7. The Knots on the Canaliculi, so Conspicuous on Those to the Right of the Lacuna, are Thought to Represent Clumps of Bacteria, Possibly in This Case the Bacteria of Decay. This is the First Time Such Definite Evidence of the Occurrence of Bacteria Has Been Studied in Material from the Rancho la Brea Fauna. The Subject is Worthy of Further Study. × about 1600.

3. The lesions may be regarded as parosteal ossifications or outgrowths from the vertebral bodies due to trauma. In this view the interpretation would fall in line with the views of Fay[7] and Carey.[8]

The vertebral lesions discussed above occur only in the sabre-tooth among all the mammals of the Rancho la Brea fauna. Although the vertebrae of the giant wolf (*Aenocyon dirus*) show a number of pathological features, yet none of them, after an examination of several thousand bones, shows definite lesions of the type discussed in *Smilodon*.

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[From Sennertus: Operum. Lugduni, 1676.]

EDITORIALS

THE CENTENARY OF THE DEATH OF PINEL

Phillipe Pinel, the father of the modern treatment of mental diseases, died on October 25, 1826. Although he made no epochal discovery, such as Laënnec's, nor was his career so phenomonal as that of Bichat; nevertheless his work justifies for him a foremost place in the ranks of those who have done most for their fellowmen.

Pinel was born on April 11, 1745, in the village of Saint Paul near Castres, in the south of France. His father was a country doctor with a small income and a large family. Phillipe was intended for the church but with the consent of his father he gave up the study of theology for that of medicine. His intelligence and industry were marked from an early age. He supported himself during his medical studies by giving lessons in mathematics and philosophy and in 1773 received his degree of M.D. at Toulouse. Pinel continued his studies at Montpellier, then renowned as one of the great medical centers of the world, for some years and then like most young Frenchmen migrated to Paris. Here he maintained himself by giving lessons in geometry and mathematics to scholars in the artillery and engineering schools of the army, by writing for scientific periodicals and by translating medical works.

Although he attended various hospital clinics Pinel seems to have made no attempt at practicing medicine until 1785, when he undertook it because of a sad event. A young man to whom he was much attached became insane and escaping from his family fled into a neighboring woods where he was killed and eaten by wolves. This event made a singular impression on Pinel. About this time a new *maison de santé*, or hospital for the insane, was opened and Pinel became greatly interested in its work, replacing restraint by kindness and treating the patients as the victims of illness, not as heretofore regarding the institution solely as a place where persons who were dangerous to the community could be confined and thereby kept from doing injury to others.

When the Royal Society of Medicine in 1792 offered a prize for the best thesis indicating the most efficacious means for the treatment of the insane who were not senile, Pinel submitted an essay in competition. Unfortunately within a few months the Royal Society of Medicine was abolished along with all the other royal institutions and the prize was never awarded. However, among the members of the prize committee of the defunct society had been one Thouret. Under the new régime he with Cousin and Cabanis had been placed in charge of the hospitals which were now under republican control. Cousin and Cabanis were both friends of Pinel, and Thouret had been much impressed by the prize thesis which he had read. They united in a request to Pinel to assume charge of La Bicêtre, then the chief institution for the insane in Paris. The shocking conditions which prevailed within it required immediate and strong measures. Here the sick, the insane, the feebleminded and the criminal were herded together in unsanitary buildings, in stone cells, without proper light or ventilation, on straw beds, infested with parasites, and at the mercy of the keepers, who were recruited from criminals, taken from the jails of Paris. The unfortunate inmates were kept in chains. For the task of cleaning these Augean stables the three administrators united in judging that Pinel was the sole man capable in France. He was nominated physician to Bicêtre and entered upon his functions in the last months of 1792. In his task Pinel was fortunate in finding an admirable coadjutor in a man named Pussin, already an attaché of the hospital, who, realizing the wrongs which he was daily obliged to witness, had already attempted to treat some of his insane charges with more humanity. Pussin hailed the advent of Pinel and proved of the greatest assistance to him in his subsequent work. In two years Bicêtre was transformed and Pinel with the faithful Pussin was transferred to La Salpêtrière to undertake the same transformation. This so-called hospital was used for the incarceration of the insane who had previously been inmates of the Hôtel Dieu. In it the same abuses prevailed as at Bicêtre.

As the result of the tremendous experience acquired in the study of such a mass of material Pinel in 1801 and again in 1809 published his classic, "Traité medico-philosophique sur l'alienation mentale," a work which revolutionized the heretofore prevalent ideas in regard to the classification and treatment of mental afflictions. Pinel had already published in 1798 a noteworthy volume entitled "Nosographie philosophique." After the abolition of all of the schools of medicine that had flourished under the aegis of the hated royalty the new republic had found it necessary to create new institutions to supply physicians and surgeons, rendered especially necessary because of the terrible wars which were now absorbing so much of its energy. Pinel was chosen to the chair of hygiene, *physique médicale* and pathology, at Paris. His geometrical mind was shocked at the confusion which prevailed in the classification of diseases and this he undertook to clarify by his "Nosographie philosophique." This work produced a great sensation and went through many editions. Faber[1] pays Pinel a high tribute:

> He laid particular stress on the importance of disregarding the individual, continually varying symptoms of disease and considering each malady as an indivisible whole taking a course subject to fixed laws. Setting aside all incidental and individual phenomena, he sought to arrive at the typical picture of the disease. In accordance with this principle he established in his system various typical "essential" fevers, each characterized by a different course and characteristic symptoms. His great personal contribution to clinical medicine, however, consists in an attempt to classify acute inflammation on a kind of anatomical basis hitherto disregarded. While in earlier times diseases were grouped on an anatomical basis as diseases of the head, chest, abdomen, etc., and of the various organs, he now divided inflammations, "les phlegmasies," into the following five orders. The diseases of (1) the skin, (2) the mucous membranes, (3) the serous membranes, (4) the connective tissue, (5) the muscles and joints. For the first time the attempt was made to demonstrate a connection and an agreement between all diseases of the mucous membranes, between those of the serous membranes, etc.

As Faber points out, this laid the foundation for the work of Bichat a few years later.

Pinel was greatly loved and honored by his colleagues. He was a man of modest and retiring disposition but of great personal bravery. A striking example of his courage is shown in the attempt he made to save his friend, Condorcet, the great philosopher, from the pursuit of the Terrorists. At a time when such action might result in his own condemnation to the guillotine, Pinel concealed Condorcet among the patients at Bicêtre. Unfortunately Condorcet insisted on leaving this shelter and when tracked to another hiding place took poison as his pursuers were on the point of arresting him. It is said that Condorcet was by no means the only unfortunate who found refuge under Pinel's protecting care. Until the end of his life Pinel continued to receive marks of honor from the various governments which succeeded one another in France. In 1823 he suffered from a cerebral hemorrhage and although he attempted to resume his work among the insane he found himself unequal to the task. On October 25, 1826, he had an apoplectic seizure from which he never rallied.

FRANCIS R. PACKARD.

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[1] Faber, K. Nosography in Modern Internal Medicine. N. Y., 1923.

BOOK REVIEWS

Pediatrics of the Past. An Anthology, compiled and edited by John Ruhräh, m.d., with a Foreword by Fielding H. Garrison, m.d., New York, Paul B. Hoeber, Inc., 1925.

Even the external dress of this choice volume carries with it a suggestion as to the rarity of its contents. The author, in his preface, speaks of its compilation as a "labor of love." Certainly only one in love with his theme could perform the task of assembling so choice a collection of material from a veritable Babel of almost forgotten tongues.

Equally, only a publisher who really loved to print beautiful books could bring together in such perfection the exact paper and type and binding and printing appropriate to describing events in those very periods of the world's history when printing elevated itself into a fine art. The result is an interesting, a scholarly and a beautiful book.

The great French detective who made it his unswerving practice in all criminal mysteries of whatever nature to "find the woman," was not the first to prove that a single underlying principle may be found to apply to many different situations. One is tempted to evolve a similar axiom as to the history of medicine since whenever anything of value relating to medical history is produced in the United States, it is well to locate Fielding Garrison. In this particular case we do not have to look very far. The volume is dedicated to him, he himself has written a Foreword so gracefully that one does not at first quite appreciate the erudition with which it is packed, and in the author's preface Dr. Ruhräh states that the book was undertaken largely because of the stimulus afforded by Colonel Garrison's association in some other work relating to the history of pediatrics.

This volume is an unique attempt to interpret, through its literature, the progress of pediatrics from the very earliest times. Beginning with the Aphorisms of Hippocrates, it ends with the writings of the younger Heberden in the middle part of the nineteenth century, thus covering practically the entire span of written history. In so far as is possible Dr. Ruhräh has sketched the lives and the characters of the pediatric writers, many of them hitherto unknown except to specialists in this field, and in nearly every instance the author gives comprehensive selections from their works.

From the writings of Bagellardus, of Metlinger, and of Roelans, the fifteenth century authors who first compiled separate books on Pediatrics, copious extracts are given. This is entirely new material. Little had been done on Bagellardus' work even though Sudhoff had paved the way and had written an analysis of Bagellardus' and of Roelans' work with characteristic generosity. Photostatic copies of the rare Roelans volume were furnished by the great German historian for the use of Dr. Ruhräh and his co-worker, Dr. Wright, in preparing this volume.

Dr. Ruhräh's rendering of the old German book, and Dr. Herbert Wright's lucid translation of the obscure fifteenth century Latin writers are examples of the kind of material which this volume contains, material hitherto entirely inaccessible to readers or writers of English.

The book is a constant delight, and when one is inclined to question Bagellardus' belief in the efficacy of powdered young porcupine or mouses' excrement as potent therapeutic agents, the author does not hesitate to point to our own irrational use of animal-organ extracts. The therapeutics of each generation is ridiculous to the succeeding one. Progress is often little more than a word. And an essay on the continuity of the new could be written after reading Metlinger's "forward-looking" essay on mental hygiene written five centuries ago, or the "modern" doctrines of Oribasius concerning behavior problems, the need of school lunches, school hygiene and proper pay for school teachers.

"Pediatrics of the Past" seems an almost perfect book of its kind. There can be no absolutely perfect book. Perfection in books is a question of taste, and therefore non-productive as a subject for dispute. And yet, I would like to have read more about the great Soranus, and scanned more of his text, and noted how his cogent maxims infiltrated the Susruta Samhita of India, a book which, while supposedly antedating the Christian era, really shows influence later than the fourth century A.D. Unquestionably Soranus, in the second century, wrote the greatest, because the simplest and most authoritative, textbook on the nursing care of the infant ever written by one person.

It would be interesting indeed to find out where and how Metlinger came by so much of the Soranian text, while Roelans possessed so little. Moschion, Constantinus and other writers not accustomed to follow Galen or the Arabian commentators might possibly have been the stepping stones between Metlinger and Soranus —but who knows?

The reader needs only to scan the pages of this volume and he will realize from the gusto of the narrative that the author enjoyed writing it.

It is not a serious complaint against a book that there is not enough of it although one may find in ancient pediatrics material enough for a dozen volumes. A score of doctorate of literature theses could be raised from its almost 600 pages. To write such a volume is, for a busy physician, a brave and a difficult task. To be able to write so delightfully and to baste the subject withal with the rich gravy of humorous philosophy, served up in a volume that is a joy to the eye as well as to the taste, is far more than a task, it is an achievement, a something that dwells only between the two rare lands of extraordinary industry and well-adapted genius.

JOHN A. FOOTE.

BEITRÄGE ZUR GESCHICHTE DER MEDIZIN. Hrsg. von Henry E. Sigerist. Heft 1. FRÜHMITTELALTERLICHE REZEPTARIEN. Hrsg. und bearbeitet von Julius Jörimann. IV. 180 pp., 1l., 2 pl., 8vo, Zürich, C. Hoenn, 1925. Heft 2. DIE LATEINISCHEN HARNSCHRIFTEN PSEUDO-GALENS. Hrsg. und bearbeitet von Hermann Leisinger. 2 p.l., 69 pp., 4 pl. 8 vo. Zurich, Orell Füssli, 1925.

These monographs, also the series entitled "Veröffentlichungen der schweizerischen Gesellschaft für Geschichte der Medizin under der Naturwissenschaften," and the fostering of a number of graduating dissertations of the University of Zürich, illustrate some of the activities of Professor Henry E. Sigerist before his assumption of the chair of medical history in the University of Leipzig and of the directorship of the Institute of Medical History upon Sudhoff's retirement. That Sigerist was selected by Sudhoff himself is a sufficient guarantee of the personal fitness and capacity of the pupil for this unique position, so difficult to fill, and of his sense of values in selecting significant problems, as evidenced in the scholarly monographs before us. The first of these, that of Jörimann, deals with three hitherto unpublished specimens of the formularies or recipe-books of the Middle Ages, derived, in this instance, from the manuscript codices of St. Gall and Bamberg. This class of literature comprised *antidotaria* or collections of specific remedies or prescriptions (antidotes) for various conditions, *receptaria* or collections of simpler recipes of general indication, isolated or fugitive prescriptions and the sections on weights and measures usually appended to the *receptaria*. The entire group will be more extensively handled in a monograph of Sigerist (now in preparation) on "The Latin Medical Literature of Switzerland in the Early Middle Ages." The three manuscript texts are analyzed as to the materia medica exploited, the forms of prescriptions used, the potions, powders, pills, pastilles, gargles, salves, plasters and other modes of administration and the various diseases and symptoms in which these remedies were indicated and exhibited. The chapter on the *receptaria* closes with an interesting section on the various superstitions connected with the use of animal extracts, including the doctrine of signatures, the medieval charms, homeopathic magic and other remnants of the Chthonian cult, lunar influences, the Egyptian days, the virtues of the numbers 3, 7 and 9, the preference for betony, plantain, agrimony, rue, artemisia and other magic herbs as analogues of the parts of various animals supposed to be of supernatural therapeutic efficiency. The medical folklorist will revel in this chapter, which is replete with instances that are anything but trite and stereotyped. The work closes with an alphabetical list of the remedies mentioned in the three formularies. All in all, the monograph is a very noteworthy building-stone for the future history of medieval medicine.

F. H. GARRISON.

BEITRÄGE ZUR GESCHICHTE DER MEDIZIN. Herausgegeben vom Institut für Geschichte der Medizin an der Universität Leipzig. Unter Redaktion von Prof. Dr. Henry E. Sigerist. Heft 2. DIE LATEINISCHEN HARNSCHRIFTEN PSEUDO-GALENS. Herausgegeben und bearbeitet von Dr. Hermann Leisinger. Zurich and Leipzig, Orell Füssli, 1925.

So valuable a study as this deserves a far better technical setting, both in the matter of paper, type and general arrangement, than has been possible in the Germany of today, where scientific productions, if they are to be printed at all, have to be printed as inexpensively as possible. Dr. Leisinger's work has a permanent value. It clears up a very puzzling problem connected with the origin of the many treatises on uroscopy, which form so large a proportion of medical writings during the later periods of the Middle Ages. In Greek medicine, as represented by the Hippocratic Corpus, the condition of the urine is frequently mentioned as a prognostic or occasionally as a diagnostic phenomenon; its color is described, its sediments noted and classified but there is no attempt to systematize or to classify all possible kinds of urines, no developed method of uroscopy. The treatises of Galen, "De Urinis" (Kühn's edition, vol. XIX, pp. 574 and 603) are, in the opinion of all Galenic scholars, spurious. As Leisinger himself says (p. 1): "It is important to note that Greek medicine, at its most flourishing period, knows no literature devoted distinctively to urines. If a text is entitled Περὶ οὔρων, we may be certain that it belongs to a later period." During the early Middle Ages, there was indeed an uroscopic literature, derived from a late Greek original, but it was not nearly so prominent as such literature became in the following centuries. The influence of Constantinus Africanus (*cf.* Choulant. Handbuch. No. 70, pp. 253ff) in the eleventh century at Salerno introduced to the West the Byzantine-Arabic uroscopy, and a new uroscopic literature developed, taking the place of the earlier literature derived from Greek originals, although, as Leisinger says (p. 68): "these texts of the early Middle Ages continued to exist for centuries, in the background and in altered forms." Leisinger's researches show us that the "Liber Galeni de urinis," surviving in some ten manuscripts and in divergent but fundamentally identical forms, is the free rendering into Latin of some Greek treatise, called into being by the needs of daily bedside medical practice and thrown into a codified form to meet the wants of the physician. It dominated the practice of the Early Middle Ages, until forced into the background by the Arabic or Byzantine uroscopy of Constantinus Africanus.

Dr. Leisinger (pp. 5–52) prints the Latin texts of eight manuscripts, the earliest of which is the Codex Sangallensis 751 of the ninth or tenth century, and the latest, the Codex Sloane 1313 of the fifteenth. The eight codices differ so much that it was impossible to edit a "textus receptus" of the book "De urinis." The Contents of each manuscript therefore is printed by itself. In the last section of his work, Dr. Leisinger (pp. 52–68) gives a general summary of the contents of the manuscripts under the following heads: Object and Method of Uroscopy; The Urine and its Characteristics; The Diseases; and The Position of the Pseudo-Galen Treatise on Uroscopy in the Literature of the Early Middle Ages. This final chapter (pp. 63–68) is the most important and gives the writer's general conclusions. It is somewhat unfortunate that in this last section (pp. 52–68), containing the summary of the teaching of the manuscripts, there are no page references to those sentences of the manuscripts which the writer is summarizing. One is forced to turn back and to look through the whole fifty pages of Latin text in order to find the passages to which the writer refers.

The reviewer has been especially interested in the clear parallels that exist between some proposition of this psuedo-Galenic book, and the treatise or fragment commonly called Prorrhetic One, in the Hippocratic Corpus, which is admitted by critics to be one of the oldest, if not the oldest, element in it. These parallels are especially clear in those psuedo-Galenic propositions which deal with phrenitis, the disease-picture which is most prominent in the first thirty-two propositions of Prorrhetic One. In No. 4 of Prorrhetic One (Littré, vol. v, p. 510), the following is given as "phrenitic": οὖρα ἄχροα, μέλασιν ἐνῇωρημένα, that is, "colourless urines that show a cloud composed of dark particles floating all through them." In the pseudo-Galen (p. 19): "Urina . . . subnigram habens ypostasin . . . significat freniticum"; also (p. 20): "Frenisis erit . . . de urina alba"; also (p. 21): "Urina habens in medio nebulam natantem . . . freniticum significat"; and (p. 29): "Urina . . . habens in medio natantem nebulam . . . si quasi nigram . . . freniticum significat." On the other hand, the oily urine, which in the psuedo-Galen is connected with phrenitis (*cf.* pp. 18, 21, 25, 34, 38, 67) has no parallel in Prorrhetic One. Phrenitis, moreover, is more frequently mentioned in the psuedo-Galen than any other disease, except perhaps vesical calculus (*cf.* pp. 61, 62, and p. 57). Psychiatric and neurological data are found on pages 15–16, 56–57, 61–62. The Four Temperaments (p. 62) may be determined by urine (p. 45: "quando urina apparet alba et tenuis significat quod in illo corpore dominat melancholia rationis").

These Latin tractates, given in the eight manuscripts, are links in a chain that leads back beyond our knowledge to some Greek original, some work at least later than Galen. Galen's name was put at the top of the work by the Latin translators, simply to recommend the work to the medical profession by connecting it with a great name.

Dr. Leisinger's study has, on page 63, a useful "Literatur," and following this are four facsimiles of the more important manuscripts. One cannot understand, however, Plate III, which gives a page from the Codex Monacensis lat. 505. The *folium* given is f. 3 *recto*. But according to Leisinger (p. 43) the psuedo-Galen "De urinis" in this manuscript is found on f. 122 *recto* to 123 *verso*. Moreover, the *folium* given in Plate III cannot contain the pseudo-Galen under discussion, as one reads in the middle of the folium, "Incipiunt Athenagore de urinis." This commences with the words: "Inter omnia quae de febribus scriptum est nihil tam utile et necessaria esse" etc., which is practically the same sentence as that with which the pseudo-Galen begins in the three oldest manuscripts, Codex Sangallensis 751, Codex Barberinus 150, and Codex Hunterianus T. 4, 13. (*Cf.* Leisinger, pp. 6, 7, 31.) Dr. Leisinger has no explanation for this somewhat surprising fact.

However, anyone, who happens to possess this second volume of Professor Sigerist's "Contributions to the History of Medicine," had better have it carefully bound at once. It deserves to be preserved.

JOHN RATHBONE OLIVER.

HIPPOCRATES. With an English translation by W. H. S. Jones. Vols. I and II. The Loeb Classical Library. New York, G. P. Putnam's Sons, 1923.

The only previous attempt at a complete English translation of the works of Hippocrates is that of Francis Adams, published by the Sydenham Society in 1849, a work to which the English-speaking profession owes the greatest debt. It afforded the opportunity to those who were unfamiliar with Greek or the other languages into which Hippocrates had been translated to acquaint themselves with the books which for upwards of two thousand years had dominated medical thought, and the Preliminary Discourse by which it was preceded stimulated an interest in the study of the ancient medical writers which caused many physicians to turn their attention to the cultural aspects of their profession. Few of those who have dwelt on its pages would willingly forego the pleasure they have derived from its perusal.

Mr. Jones gives Adams his meed when he says that his translation "is the work of a man of sense, who loved his author and was not without some of the qualifications of a scholar. The translation is literal and generally good, but is occasionally misleading. The medical annotation is far superior to the scholarship displayed in the work." Since the time when Adams wrote, our knowledge of antiquity has been greatly enlarged. Excavations at Epidaurus, Cos and other shrines have been fruitful in information bearing on its medical aspects. It is now, for instance, quite generally conceded that the Asclepiadae were not, as Adams and his contemporaries regarded them, "priest-physicians." They were a guild of lay physicians who practiced their art at the healthful spots at which the temples to the healing gods had been established. To the Reviewer they seem to have occupied a position somewhat analogous to the lay brothers who practiced surgery in the monasteries during the Middle Ages, except that the social position of the Asclepiadae would seem to have been much higher and their education broader.

The General Introduction with which Mr. Jones prefaces his translation contains a concise but most complete exposition of all the knowledge which we now possess concerning the origin of the Hippocratic collection and which of its respective portions should be regarded as genuine, and which as spurious. He advances the very plausible theory that the Hippocratic collection represents the library of the school at Cos. A school of medicine such as Cos would as a matter of course possess a library, and Jones points out that such a library would contain: "The works of the greatest of the Asclepiads, whether published or not; valuable works, of various dates and of different schools, bearing on medicine and kindred subjects; medical records and notes by distinguished professors of the school, for the most part unpublished; various books of no great interest or value, presented to the library or acquired by chance. The Hippocratic collection actually corresponds to this description."

Jones classifies the "Corpus" in order to show its heterogeneous character. It contains:

(1) Textbooks for physicians

(2) Textbooks for laymen

(3) Pieces of research or collection of material for research

(4) Lectures or essays for medical students and novices

(5) Essays by philosophers who were perhaps not practicing physicians, but laymen interested in medicine and anxious to apply to it the methods of philosophy

(6) Notebooks or scrapbooks.

Some of these are evidently pre-Hippocratic and some post-Hippocratic, but those which are considered genuine "are impressed with the marks of an outstanding genius, who inherited much but bequeathed more." Regarding the Hippocratic collection as merely a library gathered around this genuine nucleus, Jones does not consider it worth while to attempt an elaborate classification of its contents such as has been made by many of his predecessors. As to Hippocrates himself, Jones sums up all that is definitely known about his life in a single paragraph. As with the life of Shakespeare, much has been built up from this scanty material and many conjectures have arisen in the imaginations of biographers. It is enough to know that he certainly lived, moved and had his being at Cos in the fifth century B.C., and that posterity owes him an immense debt for his services to the human race. As Jones says: "We have learned to associate, almost by instinct, the science of medicine with bacteria, with chemistry, with clinical thermometers, disinfectants, and all the apparatus of careful nursing." To appreciate Hippocrates duly we must break away from all these. In the fifth century B.C. the Greeks cast aside as far as was possible for them the trammels of religious superstition. Instead of ascribing every event or phenomenon to divine interference their thinkers and philosophers sought natural causes for them. In order that medicine should become an art it was necessary in turn for it to shake off the trammels of philosophy: The genuine Hippocratic writings are singularly free from the philosophical speculations which were so harmful in their effects on the progress of science. There is also a total freedom in them from the degrading superstition which, as exemplified in the use of charms, amulets, and so forth was so hurtful to medical advance in subsequent centuries.

By careful study of the intrinsic evidence Jones shows that some of the works in the Hippocratic Corpus, such as the "Prenotions of Cos" and the "First Prorrhetic," are almost beyond doubt pre-Hippocratic. They contain a large philosophical element, much rhetoric and many hypotheses, and are very different from three other works which he next considers: "Prognostic," "Regimen in Acute Diseases," and "Epidemics I and III." The latter are written in an identical style, clear, concise with no trace of superstition, and, except perhaps in the doctrine of critical days, no philosophy. The clinical histories which they contain remain models of casetaking to the present day. In reading the too voluminous or else too scanty reports which are presented so often by recent graduates of our medical schools it has often struck the Reviewer that it would be well if in their undergraduate days they had been required to study these Hippocratic records as models for the bodies of their records to which could be appended the laboratory data which modern scientific medicine requires. They would surely learn something as to what they ought to observe, for observation is the keynote of each report. Jones refers to the criticism which has been made of Hippocrates, that he is a cold-blooded therapeutic nihilist, because he merely records what he saw of the patient's condition and does not suggest any very active course of treatment, trusting to "Nature" alone to effect a cure, and teaching that all the physician can hope to do is allow Nature a chance to cure after he has diagnosed the disease and by a study of its natural history given his opinion as to its probable course, prognosis. Jones ably refutes this charge. He gives an outline of the therapeutic measures which were employed by the author of these works: purgatives and probably emetics, fomentations and baths, barley water and barley-gruel, wine, hydromel and oxymel, venesection, and great care of the surrounding circumstances of the patient. As he remarks, we fail to see how, taking into account the scientific knowledge of the time, a much better course could have been advised in the average case. It certainly was infinitely better than the disgusting polypharmacy and overdosing, combined with excessive bloodletting, which replaced it some centuries later.

A list of the manuscript and chief printed editions of the Hippocratic collection concludes the general introduction. Each separate work of the Author is preceded by a special introduction and is accompanied by valuable annotations. As with all the Loeb Classics the original text is printed along with the translation.

The Translator has already distinguished himself by his writings on Greek medical classics. In this translation of Hippocrates we have evidence not only of his profound erudition but of his grasp of the spirit of ancient Greek medicine. These volumes in their delightful format should occupy a foremost place in every physician's library. They are calculated if placed in the hands of students of medicine to stimulate an interest in the classics of his profession which if it can be spread will be of untold benefit in these all too material days. The individual works of Hippocrates are so short that they can be "dipped into" and easily read during spare moments. If kept at hand and read from time to time as leisure warrants we feel sure the "busy practitioner" would not only derive much pleasure but increase his usefulness to his patients.

Francis R. Packard.

[From Donzelli: Teatro Farmaceutico, 1677.]

ANNALS OF MEDICAL HISTORY

Editor: FRANCIS R. PACKARD, M.D., Philadelphia

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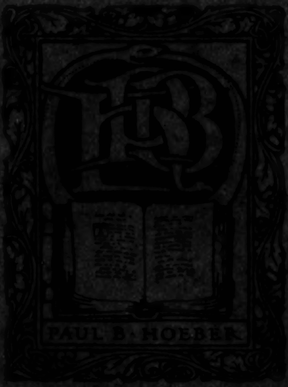
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